

*Second
Edition*

Biology

Teacher's Guide



Kells
EDUCATION

Biology

Teacher's Guide

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Biology Teacher's Guide



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To the Teacher

Dear teacher,

Biology is the scientific exploration and study of life. You will teach the structure, function, growth, origin, and evolution of living organisms. The book encourages you to teach a way of understanding the natural world and how it is related to students' everyday experiences and biodiversity, as well as medical and biotechnological advances.

Our book offers a way to guide students in understanding Biology via readings, experiments and hands-on activities. Students will learn to research, gather information, put it together and present it both in written and oral texts. New vocabulary is highlighted and explained in the glossary with clear definitions, while illustrations and photographs help to expand student's knowledge and interest.

We are certain that through your guidance and leadership students will participate in and enjoy the activities and lessons we offer in the book. And you, too, will enjoy leading students on a journey through the scientific world of **Biology!**

The authors

Unit 1 covers the topic of biodiversity and the result of evolution. It begins by discussing living creatures and an appreciation of biodiversity. Later, it focuses on Darwin and evolution and then looks at the survival of living things. Finally, it studies the microscopic world of cells and microbial diseases.

Unit 2 is about nutrition as the basis for health and life. The focus is on the relationship between nutrition and the human body. The unit covers Mexican food, and the importance of a good diet and the issue of weight loss. Finally, the unit covers sustainability and the United Nations emphasis on the environment.

Unit 3 is about respiration and the environment. It begins with the relationship between respiration and nutrition as a source of energy. The focus is on diseases, smoking and weather changes and how they affect respiration. The unit ends with a look at microorganisms that cause respiratory diseases.

Unit 4 focuses on reproduction, the importance of knowing about sexuality, understanding sexual diseases and contraception. There is a look at reproduction in sexual and asexual living things. Finally, genes, DNA and the scientific and technological knowledge regarding genetic manipulation are studied.

Unit 5 ends the book studying health, the environment and quality of life. The featured project focuses on promoting good health and being a responsible citizen.

How to use this book

Session information:

In this section, you will see the week, the course pacing as week and session. Consider each session is fifty minutes long to cover a 40 week course and you also have the expected learning outcome.

Content Delivery:

In this section, you will see recommendations to deliver information in class.

SESSION INFORMATION

Week: 1

Session: 5, 6

Expected learning outcome:

Students recognize themselves as members of biodiversity while comparing their characteristics with other living things and identifying unit and diversity related to vital functions.

CONTENT DELIVERY

Start: Form teams of six people. Students have to skim the page and provide with the following definitions: Biodiversity, ecosystem, species, genes, organic substances, cell by drawing them and showing them to their teams. Elicit for one example of each one.

Development: Students should read the full text on page 10 individually. Then, they should write a 5-question quiz about it. Then, they'll exchange notebooks having the other person respond to their quiz.

Closing: Students should give their notebooks back to the owner so that he/she can evaluate his/her partner's work.

10

Biodiversity

Biodiversity. Set of a whole variety of life forms which inhabits the earth. Comprises the differences of individuals and species' characteristics, as well as their relationships with ecosystems.

Ecosystem. System made up of organisms and conditions such as light, soil and water, integrated through continuous interactions in a specific place.

Species. Set of organisms able to breed among themselves, whose descendants are fertile. They share some common characteristics or qualities.

Genes. The smallest unit of heredity, which through reproduction carries information of characteristics inherited from one generation (parents) to another (children).

Organic substances. Any substance that contains the combination of elements like carbon, oxygen, hydrogen and nitrogen.

Cell. The smallest structural and biological unit that presents the characteristics of life, such as organization, complexity, and interaction with its environment.

Think of examples such as lilies, wolves, intestine worms, fungus, pines, sponges and bacteria. Living things are different from one place to another: desert plants are different from plants in the forest or in the jungle. The word **biodiversity** covers all varieties of living beings on our planet, as well as the environments they live in and their interaction with other organisms, including enormous animals, such as whales, and microscopic ones like bacteria. These interactions take place in aquatic and terrestrial **ecosystems**.

It is important to note that this diversity also exists between individuals of the same **species**, as can be seen in the colors and behavior of kittens from the same litter. This is because all individuals have different characteristics inherited from parents and carried in our **genes**.

In a given environment, a set of living things is called **biotic component**, and a non-living thing is called **abiotic**.

A living thing is an organism that is born, grows, reproduces, and dies. During this process, a living thing performs functions such as nurturing, breathing and reproduction.

Living things are characterized by their complexity and organization, because they are made up of different systems, each with a very specific function.

Dogs, bacteria, trees and human beings are complex and organized living things in which we observe the following characteristics:

1. They are made up of **organic substances**, organized in cells. There are living things made up of one single **cell**, such as bacteria.
2. In order to live, they obtain substances and energy from the environment through **metabolism**.
3. Metabolic processes help them to keep internal conditions, such as temperature, water content and the need for food (Fig. 1.3).
4. They experience transformations, like growth and development. Growth is the increase in size of an organ or apparatus, and development is the ability of this organ to perform certain, specific functions.
5. They have the ability to respond to the environment where they live and reproduce.
6. They are part of biological evolution, a process by which living things from the past have given birth to living things that constitute the current biodiversity.
7. The life of an individual ends, when its body stops having the functions that maintain its organization, as well as the processes which allow it to interact with the environment.

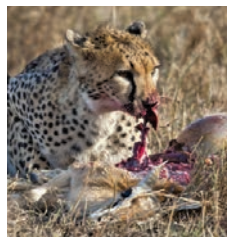


Fig. 1.3 Animals need food for energy.

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SKILLS DEVELOPMENT

Reading skills: Reading for gist.

Humanistic skills: Sharing points of view, teaching each other.

Metacognitive skills: Having partners monitor and evaluate each other's work.

EVALUATION OF CONTENT

Check at random some definitions and quizzes.

Skills Development:

This is the list of strategies you will be using in the session.

Evaluation of content:

This is the description of how you should evaluate learning outcomes.

Projects Rubrics

Aspect	Beginner	In process	Expert
Theoretical framework	The introduction is weak or there are major inaccurate aspects.	The introduction does not fit with the rest of the project or there are minor inaccurate aspects.	The introduction provides with accurate and relevant information.
Project evidence	The project has inaccurate data. It is irrelevant or repetitive and it contains questionable evidence.	The project has minor errors or it is not very elaborated.	The project is clearly explained.
Project design and performance	The variables are not controlled. The study object is not focused. There's a lack of data.	Some variables are controlled. The study object is focused. The data has mistakes.	The variables are under control. The study object is clearly focused. There are few data mistakes.
Conclusion	There is not a conclusion or it is not sustained.	There is a conclusion, but it is weakly sustained.	The conclusion is well sustained.
References	The reference list contains one or two sources but the references are incomplete.	The reference list contains three sources with complete references.	The reference list contains four or more sources with complete references.
Language use	The project is not very clear. It lacks organization, coherency or appropriate grammar use.	The project is clear, with a few flaws on organization, coherency or appropriate grammar use.	The project is coherently described and clearly stated with few grammar and spelling mistakes.
Collaborative work	Not all the members of the team presented or participated.	Some of the members of the team presented or participated.	All the members of the team presented or participated.

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Rubrics: Rubrics to evaluate students' performance in science.

Biology

Unit 2 Assessment

Date: _____
Name: _____

- Nutrition is:
 - Eating healthy food to grow strong.
 - The process through which necessary nutrients are obtained from food so that cells can perform vital functions.
 - The process from which living beings obtain food from the environment.
 - Just the ingestion of highly nutritious food.
- Which is the body part or system in charge of nutrition in animals?
 - Circulatory system.
 - Nervous system.
 - Digestive system.
 - Respiratory system.
- Proteins are formed by:
 - Lipids.
 - Mono-saccharides.
 - Fat acids.
 - Amino acids.
- The stages of nutrition are:
 - Defecation, digestion, absorption, circulation, assimilation, elimination.
 - Defecation and elimination.
 - Defecation, and elimination of what we do not need.
 - Defecation, digestion and assimilation.
- "The Eatwell Plate" classifies:
 - Fruit and vegetables.
 - Proteins, lipid, carbs.
 - Fruit, vegetables, meat.
 - Healthy and junk food.

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Biology

Unit 2 Assessment - Answer Key

- B
- C
- D
- A
- A
- C
- D
- B
- B
- A
-
- (4)
- (1)
- (5)
- (3)
- (7)
- (2)
- (6)
- B
- C
- D

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Biology

Attendance and Evaluation List

School: _____ School year: _____ Teacher: _____

Student's name	Unit attendance																Sequences grades		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			

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Summative Assessment: Unit evaluation instruments with answer key.

Attendance list and Evaluation format: These formats will help you keep track of the evaluation procedure specially designed for the content of this book.

Student book U1

SESSION INFORMATION

Week: 1

Session: 1

Expected learning

outcome: Students will identify the learning outcomes of the unit.

CONTENT DELIVERY

Start: Welcome students.

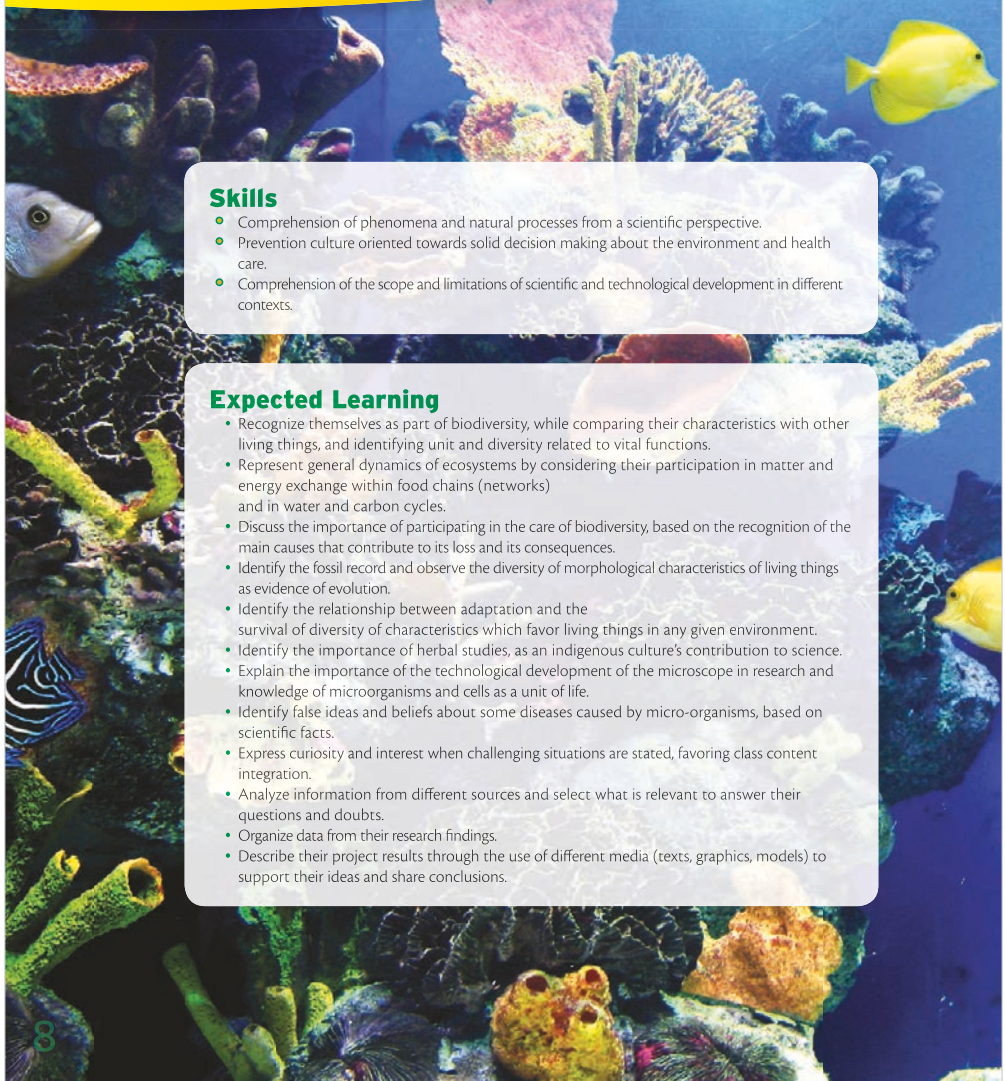
Write on the board your name, your subject, the class schedule, the evaluation and project presentation dates, ask them to write down their names on a piece of paper to call the roll from the very first class. Explain the grading criteria you will follow.

Development: Ask students to open their book to page 8. Students will read the expected learning outcomes and underline the topics they consider will be hard to accomplish. Then, they must select the best way to study the topics: Making diagrams, talking to partners, doing sample exams, doing experiments or doing choral repetition.

Closing: Ask students to think about three wild animal species that can be found around their neighborhood. Then, in trios they will choose three species from the ones they previously selected in order to develop the final project.



Biodiversity: The Result of Evolution



Skills

- Comprehension of phenomena and natural processes from a scientific perspective.
- Prevention culture oriented towards solid decision making about the environment and health care.
- Comprehension of the scope and limitations of scientific and technological development in different contexts.

Expected Learning

- Recognize themselves as part of biodiversity, while comparing their characteristics with other living things, and identifying unit and diversity related to vital functions.
- Represent general dynamics of ecosystems by considering their participation in matter and energy exchange within food chains (networks) and in water and carbon cycles.
- Discuss the importance of participating in the care of biodiversity, based on the recognition of the main causes that contribute to its loss and its consequences.
- Identify the fossil record and observe the diversity of morphological characteristics of living things as evidence of evolution.
- Identify the relationship between adaptation and the survival of diversity of characteristics which favor living things in any given environment.
- Identify the importance of herbal studies, as an indigenous culture's contribution to science.
- Explain the importance of the technological development of the microscope in research and knowledge of microorganisms and cells as a unit of life.
- Identify false ideas and beliefs about some diseases caused by micro-organisms, based on scientific facts.
- Express curiosity and interest when challenging situations are stated, favoring class content integration.
- Analyze information from different sources and select what is relevant to answer their questions and doubts.
- Organize data from their research findings.
- Describe their project results through the use of different media (texts, graphics, models) to support their ideas and share conclusions.

SKILLS DEVELOPMENT

Reading skills: Planning and organizing their own way to study the unit topics.

Interpersonal skills: Working as team members.

EVALUATION OF CONTENT

Ask students to tell you (selected at random) how they will study the topics they consider are hard.

Ask teams to tell you three species they select to make sure they do not repeat them.

Common Characteristics: Comparing Living Creatures from a Human Perspective

Reading

Peter was doubtful when he saw the calendar in an office. The pictures showed organisms from the jungle, the desert, the ocean or places covered with ice.

The calendar had green letters, the numbers "2010" showed people, plants and animals' silhouettes (Fig. 1.1). Peter really liked the calendar but he didn't understand what "2010, International year of Biodiversity" meant.

Somebody told him the calendar was there to promote the care of Nature because many living beings are endangered. When Peter got home, he looked for the word "biodiversity", and was surprised when he found out it referred to everything that is alive: dogs, fish, trees, insects, etc. and realized that



FIG. 1.1 Fig. 1.1 2010 Logo, International year of Biodiversity.

<http://www.countdown2010.net/sudamerica/ano-biodiversidad>

human beings are damaging other living things.

Peter now wants to know what he can do to help protect biodiversity and all the living beings that form part of it.

Expected Learning

Students recognize themselves as members of biodiversity, while comparing their characteristics with other living things, and identifying unit and diversity related to vital functions.

HANDS ON

What is alive?

In teams, write a list of characteristics human beings have as living things.

From the list below, identify which objects are living beings and determine which characteristics we share with them.

Make a comparative chart to show your results.

- A carrot
- A tree
- A car
- Coral
- A seed
- A robot (Fig. 1.2)
- A cat

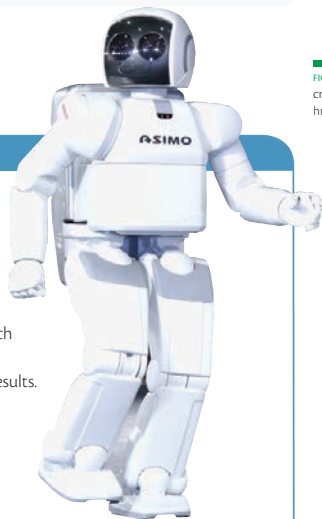


FIG. 1.2 The characteristics of living creatures have been imitated in human inventions, such as robots.

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SESSION INFORMATION

Week: 1

Sessions: 2-4

Expected learning outcome:

Students recognize themselves as members of biodiversity while comparing their characteristics with other living things and identifying unit and diversity related to vital functions.

CONTENT DELIVERY

Start: Have students open their books to page 9 and look at the logo of the reading. Ask them what biodiversity is and have them brainstorm ideas and write on the board their idea.

Development: Ask students to define biodiversity. Check it in whole class. Then ask them to read the hands on activity and answer it. Then ask them "What's the name of the action we do to get oxygen?". Then, form teams and have them choose the characteristics each example has.

Closing: Students will compare their findings with members from other teams. Check their answers in whole class.

Homework: Students should prepare the experiment in the lab explained on page 11.

SKILLS DEVELOPMENT

Verbal-linguistic skills: Remembering visual details

Speaking skills: Scanning for the definition of biodiversity.

Critical thinking skills: Comparing and contrasting information to identify characteristics of living things.

EVALUATION OF CONTENT

Ask them to write a brief summary of the time period main events.

SESSION INFORMATION

Week: 1

Sessions: 5, 6

Expected learning outcome:

Students recognize themselves as members of biodiversity while comparing their characteristics with other living things and identifying unit and diversity related to vital functions.

CONTENT DELIVERY

Start: Form teams of six people. Students have to skim the page and provide with the following definitions:

Biodiversity, ecosystem, species, genes, organic substances, cell by drawing them and showing them to their teams. Elicit for one example of each one.

Development: Students should read the full text on page 10 individually. Then, they should write a 5-question quiz about it. Then, they'll exchange notebooks having the other person respond to their quiz.

Closing: Students should give their notebooks back to the owner so that he/she can evaluate his/her partner's work.

GLOSSARY

Biodiversity. Set of a whole variety of life forms which inhabits the earth. Comprises the differences of individuals and species' characteristics, as well as their relationship with ecosystems.

Ecosystem. System made up of organisms and conditions such as light, soil and water, integrated through continuous interactions in a specific place.

Species. Set of organisms able to breed among themselves, whose descendants are fertile. They share some common characteristics or qualities.

Genes. The smallest unit of heredity, which through reproduction carries information of characteristics inherited from one generation (parents) to another (children).

Organic substances. Any substance that contains the combination of elements like carbon, oxygen, hydrogen and nitrogen.

Cell. The smallest structural and biological unit that presents the characteristics of life, such as organization, complexity, and interaction with its environment.

Think of examples such as lilies, wolves, intestine worms, fungus, pines, sponges and bacteria. Living things are different from one place to another: desert plants are different from plants in the forest or in the jungle. The word **biodiversity** covers all varieties of living beings on our planet, as well as the environments they live in and their interaction with other organisms, including enormous animals, such as whales, and microscopic ones like bacteria. These interactions take place in aquatic and terrestrial **ecosystems**.

It is important to note that this diversity also exists between individuals of the same **species**, as can be seen in the colors and behavior of kittens from the same litter. This is because all individuals have different characteristics inherited from parents and carried in our **genes**.

In a given environment, a set of living things is called **biotic component**, and a non-living thing is called **abiotic**.

A living thing is an organism that is born, grows, reproduces, and dies. During this process, a living thing performs functions such as nurturing, breathing and reproduction.

Living things are characterized by their complexity and organization, because they are made up of different systems, each with a very specific function.

Dogs, bacteria, trees and human beings are complex and organized living things in which we observe the following characteristics:

1. They are made up of **organic substances**, organized in cells. There are living things made up of one single **cell**, such as bacteria.
2. In order to live, they obtain substances and energy from the environment through metabolism.
3. Metabolic processes help them to keep internal conditions, such as temperature, water content and the need for food (Fig. 1.3).
4. They experience transformations, like growth and development. Growth is the increase in size of an organ or apparatus, and development is the ability of this organ to perform certain, specific functions.
5. They have the ability to respond to the environment where they live and reproduce.
6. They are part of biological evolution, a process by which living things from the past have given birth to living things that constitute the current biodiversity.
7. The life of an individual ends, when its body stops having the functions that maintain its organization, as well as the processes which allow it to interact with the environment.



FIG. 1.3 Animals need food for energy.

10

SKILLS DEVELOPMENT

Reading skills: Reading for gist.

Humanistic skills: Sharing points of view, teaching each other.

Metacognitive skills: Having partners monitor and evaluate each other's work.

EVALUATION OF CONTENT

Check at random some definitions and quizzes.

In the Lab

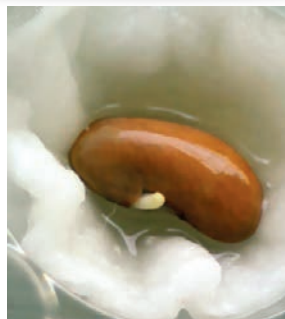
Material

- * Paper towel.
- * Beans.
- * A glass jar.

Procedure

- Place a damp paper towel in a glass jar, and some beans between the paper towel and the side of the jar. Set the jar in a place with sunlight. Check the beans for a week. If the towel needs water, add some drops. Each day, record your observations and make some drawings (Fig. 1.4).
- Answer the following questions based on your observations:
 - Is the seed you observed alive? Support your answer.
 - What characteristics of living things could you identify?
 - What is your conclusion from this experiment? Is it easy to identify something which is alive? Yes? No? Why?

FIG. 1.4 Germination is when a bean starts to grow roots.



Human Participation in the Dynamics of an Ecosystem

➔ Research

Draw a picture that represents your relationship with nature (Fig. 1.5). Show your drawing to other classmates and compare your activities identifying those which may damage the environment and those which may benefit it.

The environment is everything that influences a living thing, setting all conditions to carry out its functions. The environment consists of living things, abiotic components such as air, water, soil and the relationships between all these **organisms**.

Living things or organisms that make up biodiversity establish close relationships with their environment in order to stay alive. For example, after ripening, the fruit falls to the ground, where the seeds find the right conditions to germinate, giving life to new plants that grow and interact with other beings. Rain, soil, plants, insects and animals make up a constant life **cycle**.



FIG. 1.5 Students improve their observational skills by drawing in Biology class.

➔ Expected Learning

Represent general dynamics of ecosystems by considering their participation in matter and energy exchange within food chains and with water and carbon cycles.

GLOSSARY

Organism. It is a living thing with a structure and an organization which are necessary to interact and exchange matter and energy with the environment.

Cycle. Period of time in which a process and its phases are developed, and continuously transformed.

SESSION INFORMATION

Week: 2

Session: 7

Expected learning

outcome: Represent general dynamics of ecosystems by considering their participation in matter and energy exchange within food chains and with water and carbon cycles.

CONTENT DELIVERY

Start: This activity is done in the lab. Therefore, make sure students are ready with the experiment. They will share their findings.

Development: Students should answer the questions on page 11. Ask them to bring the experiment to evaluate their report or have them do it in the lab. They should discuss and deliver a paper that includes:

Explanation of the experiment.

Findings.

Conclusion.

Evidence.

Closing: Students should deliver their experiment report.

SKILLS DEVELOPMENT

Naturalistic skills: Observing details, categorizing, comparing and contrast.

Writing skills: Outlining, drafting, revising, editing.

EVALUATION OF CONTENT

The project might include: A report of direct observation, anecdotic register, information research, concept mapping, oral or written narrative. See the Teacher's Guide projects rubrics page 132.

SESSION INFORMATION

Week: 2

Session: 8

Expected learning outcome: Represent general dynamics of ecosystems by considering their participation in matter and energy exchange within food chains and with water and carbon cycles.

CONTENT DELIVERY

Start: Students will draft a picture that represents their relationship with nature. Ask them some questions to guide them such as: What do you eat? Where does your food come from? Etc. Students will share their pictures in whole class. Select them at random.

Development: Students will read the definitions of organism, cycle and ecosystem. Then, they should revise and edit their drawing including such concepts. In teams, they will do the hands on activity with the school garden or any other garden they prefer. They should plan and organize the activity.

Closing: Students should tell the definitions of organism, cycle, and ecosystem in their own words.

Project preparation: Students should give a presentation and bring some cardboard, images of animals and plants, markers, scissors and glue stick in order to create a food chain.

An ecosystem is an integrated set or community of living organisms and its relationship and interaction with the environment. In an ecosystem each component depends on the other, therefore, if one of them changes or disappears, all the others will be affected.

→ HANDS ON

Observation and explanation frame

1. Work in teams and establish an area in your school to observe an ecosystem.
2. Identify the different organisms and the number of individuals living in that place.
3. Register your observations in a graph like the one below, considering the organisms' behavior, what they eat, their relationship with other organisms and the environmental conditions, such as air, humidity, temperature, etc.

Graph 1.1 Richness and diversity at Juventino Rosas' Park

Scientific or common name	Number of organisms	Observation site	Comments
Rose	15 plants	Sunny places	Without flowers
Arum Lily	15 plants	In the shadow	With many flowers
Lizard	4 specimens	On a tree	Resting
Sparrow	12 birds	In the square	Eating

4. Answer the following questions in your notebook.
 - Where did you find more plants and animals?
 - Which are the most abundant plants and animals? Why is it so?
 - Which are the most scarce? Why is it so?
 - Compare your results with those of your classmates' and discuss how to prevent any damage to this ecosystem and its organisms.

READ more

The number of living species on the Earth is 1.7 million. It is approximate because each year thousands of new species are found.



FIG. 1.6 After a volcano eruption, vegetation can start covering the area again.

Organisms and their ecosystems can change for many reasons, including natural disasters such as hurricanes, floods, or volcanic eruptions (Fig. 1.6). Human activities also produce transformations in the ecosystems. For example, agriculture and the cattle industry introduce new species that compete with the native ones, altering the region.

To study an ecosystem it is necessary to identify the different species living in the area, their number and distribution; it is also important to know how the exchange of matter and energy is established among the living things and the environment. Matter is the substance everything is made of, and causes things to have weight. Energy is what produces change.

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SKILLS DEVELOPMENT

Metacognitive skills: Plan, organize and deliver.

Critical thinking skills: Reformulating.

Interpersonal skills: Leading, organizing work load.

Intrapersonal skills: Developing their understanding of their relationship with nature.

EVALUATION OF CONTENT

Check their drawings as well as their hands on activity organization per team.

Food chains

The exchange of matter and energy in any ecosystem can be analyzed through the relationships that different organisms establish in order to obtain food. A food chain begins with organisms called producers or autotrophs that can perform photosynthesis. A food chain is a sequence that starts from these producers and ends at species called decomposers.

In the picture on the right (figure 1.7), we can observe that the food chain begins with a plant, which is the producer organism, it is consumed by some insects and larvae. The chain continues when the insects and larvae are consumed by a frog, which are the snake's food. The eagle feeds on the snake and the remains of all of them are the source of food of the decomposers.

In order to obtain food and energy, organisms have two options:

1. Produce the **nutrients** by themselves; for example, when plants transform materials like water and carbon dioxide into organic substances such as sugars.
2. Use the nutrients from other organisms, like herbivores and carnivores. These organisms are known as heterotrophic organisms which need to use the complex substances found in the body of other organisms.

The organisms that produce their own nutrients are called primary producers, and are at the beginning of the food chain. The following organisms in the chain are the consumers which can be primary, herbivores that feed directly from plants, then secondary and tertiary are the carnivores that feed on other consumers.

Decomposer organisms make up the last level in the food chains, they transform the organic remains into the most simple substances, which will be part of the environment later on.

Food chains are complex connections because the same primary producers could be the support of various primary consumers; as well as the food of secondary consumers called predators.

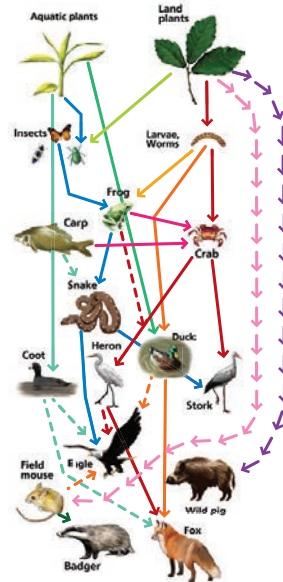


FIG. 1.7 The great diversity of interactions in a food chain can show the impact of species' extinction in any ecosystem (the arrows in this chain point to the predators)

GLOSSARY

Nutrient. Element or chemical compound necessary for the metabolism of a living thing.

HANDS ON

Representing processes

Work in teams and use the information you obtained in the previous activity about organisms and their environments. Then, create a diagram in which you represent the food chain. Where would you include humans in this chain?

SESSION INFORMATION

Week: 2

Session: 9

Expected learning

outcome: Represent general dynamics of ecosystems by considering their participation in matter and energy exchange within food chains and with water and carbon cycles.

CONTENT DELIVERY

Start: Students should present their research on the hands on activity.

Development:

they should give a presentation and bring some cardboard, images of animals and plants, markers, scissors and stick in order to create the food chain. Students should read the information on food chains on page 13. Then, they should work on the hands on activity. Form teams and get them to work.

Closing: Students should make a diagram in which they represent the food chain including humans.

SKILLS DEVELOPMENT

Verbal-linguistic skills: Giving a presentation in whole class.

Visua/Spatial skills: Drawing data.

Critical thinking skills: Defining concepts.

EVALUATION OF CONTENT

Students should include in their presentation the answers to the hands-on activity requirements. See the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 2

Sessions: 10, 11

Expected learning

outcome: Discuss the importance of participating in the care of biodiversity, based on the recognition of the main causes that contribute to its loss and its consequences.

CONTENT DELIVERY

Start: Ask students for the meaning of “endangered species”. Get to a definition and have it written down on the board by a student.

Development: Have students read the page 14 and in pairs, they should write 5 information questions about it. Check the questions. Once they finish, have them exchange notebooks and answer them. Then, in pairs, get them to prepare the research on page 14 to present it the following class. Students should make a poster in which they explain the results of the research.

Closing: Show them some pictures of endangered Mexican species and have them do a sample research to develop the project. In sessions 11-12, have them give their presentations. Discuss on how they can help prevent more species from disappearing. Get them to read the chart *In your community* and in teams, they should prepare a presentation about it to present it next class.

→ Expected Learning

Discuss the importance of participating in the care of biodiversity, based on the recognition of the main causes that contribute to its loss and its consequences.

Appreciation of Biodiversity: Causes and Consequences of its Loss

Biodiversity is considered an essential part of our world's heritage, because it helps to maintain the health of our planet's ecosystems. Objects that make human life possible are made of plants, fungus, animals and even microorganisms. In the environment, microorganisms degrade organic waste, which prevents its accumulation and contributes to making soil that maintains forests or crops, and prevents erosion.

FIG. 1.8 Forests are threatened by human activities. In our country, the substitution of forests for farmland is reducing them gradually.



FIG. 1.9 A loss of biodiversity can lead to an increase in poverty.

Preserving biodiversity is not only about caring for animals and plants, it is also about appreciating its beauty, valuing our ability to take care of it and living in harmony with other living things.

Biodiversity has been affected by human activities, such as farming, livestock breeding and mining, which pollute the air, the land and water with toxic substances causing death to many organisms (Figure 1.8).

The over-exploitation of certain species, through hunting, fishing or trapping, has caused them to be threatened or endangered. The introduction of new species to ecosystems also produces negative changes in biodiversity.

→ Research

Has biodiversity changed in your city or town?

If you know someone who has lived in your town or city for many years, ask him/her about the kind of plants and animals that existed before, which ones can no longer be found and why.

Write down their names, characteristics and how they were used. Also investigate whether there are other kinds of organisms today and what they are.

Compare the information you obtained from your own experience. Discuss with your classmates and teacher if it is possible to see the difference in your community's biodiversity with this information.

The loss of biodiversity is a problem that causes lack of human well-being and can be a threat to all species on the planet. A consequence of this problem is the increase in poverty in several countries, since many people in the world cannot look after their basic needs (Fig. 1.9).

The current way in which we interact with nature has led to serious environmental problems, such as the extinction of some species, accelerated erosion, deforestation and climate change.

14

SKILLS DEVELOPMENT

Interpersonal skills: Debating and discussing the questions.

Naturalistic skills: Protecting the environment.

Critical thinking skills: Formulating questions.

EVALUATION OF CONTENT

Check the questions they write and the answers they give to their peers' questionnaires.

In session 8, check the information they bring, the visuals they show, and the information they provide the class with. See the Teacher's Guide projects rubrics on page 132.

In your community

Biodiversity threats in our community

With the help of your teacher, work in teams and search for information about different factors that threaten biodiversity in your community. Also collect information about proposals to reduce and prevent these problems.

You can choose among the following topics: Felling of forests, forest fires, cattle raising, introduction of new species, and overexploitation of species for commercial use.

Discuss how young people your age can help to preserve diversity.

Draw up a report and present it to the group, it can be a bulletin board or a debate.



FIG. 1.10 Solar panels use sunrays to heat water for the house.

Sustainable development is, so far, the best answer for a better use of natural resources without deteriorating the environment. The fundamental principle is that the use of natural resources to meet the demands of the present, must not put at risk future generations' needs. This means that each of us must use resources responsibly so that future generations have everything they need to live.

Some ways to contribute are: buying only what is necessary, recycling, using some alternative technologies such as solar water heaters and carrying out other similar actions (Fig. 1.10).

Fulfilling our needs without harming the environment is not an easy task, since many of our daily activities are based on processes that generate pollution and overexploit natural resources, decreasing the biodiversity on our planet.

An example of this, are the problems caused by technology and fuels like gasoline and oil, which affect the air, water and soil.

Although it is not possible to stop using these resources right away due to economical and social losses; a solution to this problem, is to design clean technologies that do not pollute the air, such as solar energy or wind power.

It is important to mention that we can participate in the promotion of clean technology supporting its use at home, for example using solar energy ovens and water heaters, instead of gas. Another way to contribute to the conservation of biodiversity is by being conscious and responsible in the consumption of natural resources, that is, consuming only what it is necessary and save water and energy.

As responsible consumers of the environment we must avoid buying products that come from endangered species, obtained illegally; as well as plants and wild animals. Being responsible for our waste, such as wrappers or containers, is another way to contribute, since they can easily pollute large areas.

Our active and continuous participation is very important to preserve biodiversity, by taking action and communicating what we know to others, we also collaborate to protect the environment.

In units 2 and 3, we will study, some actions that are aimed at protecting biodiversity and the environment.

SO FAR YOU HAVE LEARNED THAT...

- Human beings are part of biodiversity and therefore share the characteristics of living things.
- In ecosystems, living things are part of a series of interactions with their environment in which matter and energy are exchanged.
- Some human activities have negative effects on the ecosystems' dynamics.
- It is important to have information to participate in actions aimed for the protection of the environment.

15

SESSION INFORMATION

Week: 2

Sessions: 11, 12

Expected learning outcome:

Discuss the importance of participating in the care of biodiversity, based on the recognition of the main causes that contribute to its loss and its consequences.

CONTENT DELIVERY

Start: Students should give their presentations about biodiversity threats in their community and they should self-evaluate their work. Later, they should state what they should improve for a later presentation.

Development: In teams, they should read the information on page 15 and should decide on the best thing to do to avoid such biodiversity threats.

Closing: In whole class, they should decide what solutions they could implement to avoid such threats in their communities.

Project preparation: Form teams of four people. They should prepare a TV show in which one of them will play a famous character. The characters to be played are: Nicolas Steno and Charles Darwin. The teams should do research They should dress up; prepare some realia and a questionnaire for their classmates.

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating and improving their presentations.

Critical thinking skills: Problem solving.

Verbal-linguistic skills: Debating and discussing.

EVALUATION OF CONTENT

Listen to their proposals on how to give a better presentation. It is important too that they listen to your feedback to know exactly what is necessary to improve. See the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 3

Sessions: 13, 14

Expected learning

outcome: Identify the fossil record and observe the diversity of morphological characteristics of living things as evidence of life evolution.

CONTENT DELIVERY

Session 13

Start: You should have all teams present their TV show. After every team gives the presentation, have them get some feedback from their classmates and make any necessary suggestions on how to improve it.

Development: Prepare some comprehension-check questions regarding the sequence objective to make sure everyone understands the theory of evolution so as to explain it easily.

Closing: Have them exchange questionnaires with other teams and answer them.

Session 14

Start: Make a tic-tac-toe with 9 questions about the Theory of evolution. The group will work in two teams.

Development: Have them read page 16 and assign new words to be explained by different teams.

Closing: Students should work on the hands on section.

→ Expected Learning

Identify the fossil record and observe the diversity of morphological characteristics of living things as evidence of life evolution.



FIG. 1.11 Ammonite Fossil, extinct sea animal.

Recognizing Evidence from which Darwin Explained the Evolution of Life

Nicolas Steno and the beginning of paleontology

Reading

In 1666, some fishermen captured a huge shark on the coast of Livorno, Italy. Everybody was astonished by this and Fernando de Medici, Grand Duke of Tuscany, ordered the study of the remains of this animal.

The body of this shark ended up with Nicolas Steno, who was interested in anatomy and the study of rocks.

Steno made a dissection and was surprised at the great resemblance between the teeth of the huge shark with some rocks known as "tongue stones".

The tongue stones were a curiosity of the earth at that time, and there were different myths explaining how they were formed. The tongue stones called the attention of the scholars due to their similarity to seashells, starfish and even to bones and huge skulls, which were buried in certain places, and

sometimes would appear after the rain. For many, the shapes these rocks had, were coincidences that came naturally, specially when the mineral seemed to imitate some features of living things. However, Steno gave a new explanation: the tongue stones had been the teeth from sharks which had lived a long time ago and after a long process they had been petrified. In this process, the organic components of the teeth had been substituted little by little, by minerals, without changing their shape, transforming the tissue into stone.

Steno offered a new explanation of the processes that formed the rocks, and fossils came to be evidence of living things that inhabited the Earth in the past (Fig. 1.11).

Two new branches of science were born from the close comparison between teeth and rocks: Paleontology and Geology.

Adapted from: Angulo Villanueva, Rita (2009) Nicolas Steno, Geology and the formation of the scientific object. Una Mirada arqueologica. X Congreso Nacional de Investigación Educativa. Veracruz, 21 a 25 de septiembre de 2009.
http://www.comie.org.mx/congreso/memoria/v10/pdf/area_tematica_08/ponencias/0465-Epdf

→ HANDS ON

Work in teams and make a chart showing how a shark's tooth fossil is formed

- Share your chart with the group and compare your results.
- With your teacher's help, discuss how you can explain that the living things from the past are so different from the ones we find in the present.

Fossils come in the form of rocks that have the shape of seashells, bones, teeth, and other parts of the body. For many years, it wasn't thought that their origin was related to living things.

In the XVII century, when fossils began to be considered evidence of past life forms, some scholars studied their anatomic structures in detail so they could identify which specimen they belonged to.

16

SKILLS DEVELOPMENT

Bodily/Kinesthetic skills: Acting.

Critical thinking skills: Remembering.

Humanistic skills: Sharing ideas, group interaction.

EVALUATION OF CONTENT

See the Teacher's Guide projects rubrics on page 132.

In session 4, consider who participated and who didn't. Who gave clear ideas on explaining from their point of view how the shark's tooth fossil is formed.

During the XIX century, a group of **fossils** came to the attention of some Englishmen. Although they were reptiles, they weren't familiar to any current species. It all indicated they had inhabited vast areas of the planet, and were especially large specimens (Fig. 1.12).



FIG. 1.12 Skeleton of a dinosaur in The Museum of Natural History in London, England.

In 1842, this group was given a name: Dinosaur, from Greek deinós "terrifying" + "saurus" "lizard". This name was chosen by Richard Owen, scholar of anatomy, who was interested in giving a name that reflected the majestic size of these animals from the past.

Owen made the first reconstructions with great anatomic precision of dinosaurs. People were fascinated imagining landscapes from the past in which these terrible lizards stalked their preys. Both dinosaurs and their reconstructor gained popularity quickly.

It wasn't until 1859, when Charles Darwin proposed that fossils were an important evidence of biological evolution. **Biological evolution** is the process of changes in life, giving origin to the diversity of organisms that we can observe on our planet in the present, based on the living things that existed in the past (Fig. 1.13).

Charles Darwin offered his work entitled: "On The Origin of Species", he performed many tests to demonstrate the theory of evolution. Darwin proposed that evolution could be studied from fossils, keeping in mind three important aspects:

1. Fossils are the remains of organisms which became part of rocks over time.
2. Formation of rocks is a process that takes a long time, so fossils are the record of organisms which lived in a distant past.
3. Comparing the structures of the fossils, we can relate them to current species and observe forms that no longer exist.

Fossils are considered proof that life on our planet was different in other eras, and that organisms of recent times are more like present ones. Therefore, fossils are evidence of the change of species over time (Fig. 1.14).



GLOSSARY

Fossil. A remnant, impression, or trace of an organism of past geological ages that has been preserved in the earth's crust.

Biological Evolution. Process in which past living things gave origin to the living things' present biodiversity.

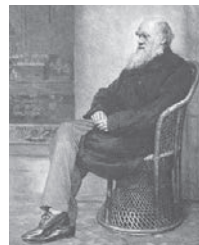


FIG. 1.13 Darwin's controversial work, The Origin of the Species, was published in 1859.

FIG. 1.14 All the diverse and amazing shapes that we can find in nature are explained by the theory of evolution.

SESSION INFORMATION

Week: 3

Sessions: 15, 16

Expected learning outcome: Identify the fossil record and observe the diversity of morphological characteristics of living things as evidence of life evolution.

CONTENT DELIVERY

Start: Prepare a set of 4 questions regarding the theory of evolution. Then, play hot potato (students should pass a ball while you count to 7, for instance) and ask them the questions you prepared.

Development: Ask students to read the page and rap with the information on the page and the information they remember from the theory of evolution in groups of four or five. Then, they should give themselves a grade on their rap.

Closing: Have students imagine how they think their favorite animal has evolved using the information from the theory of evolution.

Homework: Have them prepare for next class a dinosaur fossil. Look in the web for a video to help you and them out. They should build it in class.

SKILLS DEVELOPMENT

Musical skills: Rapping.

Logical/Mathematical skills: Discovering relations.

Metacognitive skills: Planning, organizing, self-monitoring.

EVALUATION OF CONTENT

Evaluate how many concepts they included in their rap, if they really made sense.

See the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 3

Sessions: 17, 18

Expected learning

outcome: Identify the fossil record and observe the diversity of morphological characteristics of living things as evidence of life evolution.

CONTENT DELIVERY

Session 17

Start: Have them make their dinosaur fossil in class.

Development: Explain step by step how to make the fossil.

Closing: Have them label their fossils to decorate the room. If possible, take pictures.

Session 18

Start: Have them come up with the definition of Fossil.

Development: In teams, they should read page 17 and summarize it.

Closing: Students should exchange summaries to get them edited by other teams. For homework, they should copy the fossils in the picture of the hands on activity on page 18.

HANDS ON

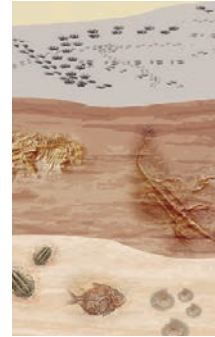
The heavy rains in a mountain zone have left an uncovered wall of rock where you can find fossils from different organisms. Your team is in charge of observing these fossils and of proposing a reconstruction of that region's history.

Observe the picture on the right and answer the following questions:

1. Why can we find remains of seashells and sea organisms in a mountain zone?
2. How many seasons from the past can be seen in the uncovered layers? Give reasons for your answer.
3. Based on the fossil record, which are the major changes in the organisms that inhabit the region?

With your team, choose one of the layers and make a drawing representing what the region looked like in the past.

Compare your drawings with the other teams', and describe how the region was transformed. Indicate what information is needed to reconstruct the region's history in a more detailed way.



Evolution is not only a known idea to talk about the past, it is a theory that explains life on Earth through time. Evolution allows us understand biodiversity, and the relationship of organisms with their environment, it also explains why all the living things have common characteristics, including fossils.

A very important aspect of biological evolution is that through time, living things are constantly changing. As a result we have biodiversity, because changes give origin to new kinds of organisms.

The theory of evolution explains why inside biodiversity all living things share some features like their chemical composition, the fact they are all formed by cells, and other functions like respiration and nutrition.

Darwin compared the characteristics of some fossils with modern day species. His studies showed how living things had changed in different regions through time (Fig. 1.15).

FIG. 1.15 Some fossils show a resemblance to organisms observed in the present.



18

SKILLS DEVELOPMENT

Visual/Spatial skills: Building models.

Critical thinking skills: Summarizing.

Writing skills: Drafting, revising, editing.

EVALUATION OF CONTENT

Check how well made the fossil is, the quality of their summary and their editing work.

Relationship between Adaptation and Differential Survival of Living Things

The adaptation of living things is shown in features of the species which allows them to survive in a particular environment. For instance, the wings and the body of a bird are adaptations that allow them to fly or the color and the shape of the stick insect which are a perfect camouflage. (Fig. 1.16).



The theory of evolution explains how **adaptation** takes place. Darwin referred to the changes in living things as a collective expression. An individual grows, develops and changes, but evolution is a process that occurs in all species over time.

Besides similarities, individuals also have differences. Even though parents and children are very much alike, there are features that make them unique, and this is very important from a biological point of view. The characteristics that differentiate an individual from another, give each one a slightly different life: like being a little bit taller or faster. The differences in the characteristics of the individuals in a population are called: "population variability" (Fig. 1.17).



Darwin provided evidence that these differences between individuals have effects on their survival and reproduction. From his observations, Darwin stated that some organisms would disappear; meanwhile, others would reproduce and pass on their features to their descendants. Through time some of these features will extend to the population; that is, more individuals will have the adaptation, which will make them more suitable to survive and reproduce.

This process is called **natural selection** and it explains how populations are changing as a result of the survival and reproduction of some individuals, in a determined environment, passing on to their children the features that allow them to survive and reproduce more than others.

The adaptation process in a population begins with a group of individuals that have different features that may be inherited by their children; such features make them more suitable and help to extend the population. These changes do not have a particular direction, this means that natural selection does not have as an objective to generate whales, hens or human beings.

→ Expected Learning

Identify the relationship between adaptation and the diversity of characteristics which favor the survival of living things in any given environment.

FIG. 1.16 The mimesis of the stick insect is a clear sample of how natural selection works.

FIG. 1.17 Among individuals of the same species there may be differences in their characteristics.

The natural variation of a population gives individuals different abilities to survive and reproduce.

Most fit individuals will survive and reproduce more than others.

In the end, the population has a portion of individuals different from the original, because there is a large proportion of the healthiest organisms.

GLOSSARY

Adaptation. Physical or behavior features which allow organisms to survive and reproduce successfully in a determined environment.

19

SESSION INFORMATION

Week: 4

Sessions: 19, 20

Expected learning outcome: Identify the relationship between adaptation and the diversity of characteristics, which favors the survival of living things in any given environment.

CONTENT DELIVERY

Start: Ask students to look at two different dogs. One that looks thin and the other fat. Set the dogs in two different environments. One in which they have to run or walk a lot to get food and the other where it's really cold. Who is more efficient in each environment? They should give their reasons for their answer.

Development: Students should read page 19. Then, they should find the definition of adaptation and natural selection.

Closing: Prepare a few pictures of different animals or plants. Set them in groups. They should mention at least two examples of adaptation and natural selection using the pictures you provided with. They should also explain the reasons they can find for the adaptation and natural selection.

Homework: Set teams of four. Ask them to read page 20 to be ready for an experiment. There's the list of materials to take to class.

SKILLS DEVELOPMENT

Metacognitive skills: Self-evaluating.

Writing skills: Drafting, elaborating, revising, editing.

Naturalistic skills: Observing details, comparing and contrasting, categorizing.

EVALUATION OF CONTENT

Evaluate their experiment and report. Evaluate how accurate is their self-evaluation. Show them the aspects to consider in an experiment to receive a grade.

SESSION INFORMATION

Week: 4

Sessions: 21, 22

Expected learning

outcome: Identify the relationship between adaptation and the diversity of characteristics, which favors the survival of living things in any given environment.

CONTENT DELIVERY

Start: Students might present their research in case they couldn't finish the previous class. Otherwise, they should respond to the following mini quiz:

What is adaptation?
What is natural selection?
Give one example.

Development: Set teams of four. Ask them to read page 20 to be ready for an experiment. There's the list of materials to take to class. Students should do the experiment. Follow the procedure. Help them out accordingly.

Closing: Have students write down a report following the writing process: They should also self-evaluate their experiment.

Homework: Students should do research on the evolution of whales.

In the lab

In this activity, you will simulate the adaptation process which could appear in the individuals of a population. For this purpose, each team will need 100 lentils and 100 rice grains, a white cardboard, a meter of paper or colour printed fabric, and a box or bottle where you can mix the seeds.

The activity consists on observing how two different kinds of seeds "survive" in two different environments. First place the seeds on the white cardboard, and then on the fabric. In each case, a "collector" of seeds will grab some of them. Let's consider that those seeds did not survive (Fig. 1.18).



FIG. 1.18 A process by which an animal or plant species becomes fitted to its environment.

Before starting, answer the following questions:

1. Which seeds will have more "survivors" on the white cardboard? Rice? Lentils? Will they survive the same way?
2. Which seeds will survive on the printed fabric?
Write down your answers to compare them at the end of your experiment.

Procedure

- Put the white cardboard on the table. Mix 50 lentils, and 50 rice grains in the box or bottle. Now scatter the seeds on the cardboard. The "collector" of the team must pick up the seeds one by one, during 10 seconds.
- Separately count the number of lentils and the number of rice grains that stayed on the cardboard. Repeat the procedure using the fabric or the printed paper.
- Write down the information you obtained from both times and answer the following questions:

Analysis results

1. Where did you pick up more rice seeds from, the cardboard or the fabric? Did you expect this result? Yes? No? Why?
2. Where did you pick up more lentils from, the cardboard or the fabric? Did you expect this result? Yes? No? Why?
3. Discuss with your classmates and teacher the characteristics of the biological evolution process that you observed in this activity. Consider the following questions: What does the action of picking up seeds represent? What do the proportions mean in each kind of seed in the population? How is reproduction included in this pattern? How is the natural variation included?

Conclusions

Adaptation is a physical or behavioral characteristic that allows an organism to survive in any environment. Considering this definition, explain the adaptation process using as an example what you observed for rice or lentils in this experiment.

Write all the possible answers in your notebook. Follow your teacher's directions to write a report about the activity.

20

SKILLS DEVELOPMENT

Metacognitive skills: Self-evaluating.

Writing skills: Pre-writing, drafting, editing, proofreading, publishing.

Naturalistic skills: Observing details, comparing and contrasting, categorizing.

EVALUATION OF CONTENT

Evaluate their experiment and report. Evaluate how accurate is their self-evaluation. Show them the aspects to consider in an experiment to receive a grade. See the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 4

Sessions: 23, 24

Expected learning outcome: Identify the relationship between adaptation and the diversity of characteristics, which favors the survival of living things in any given environment.

Do research on the evolution of whales to show that their ancestors were land organisms. When Darwin tried to explain how whales started from land mammals, people said it was not only incorrect but also ridiculous. Even now, many people think this evolution theory sounds weird when it points out that whales have their origin in a group of organisms adapted to walk on four legs, which swam occasionally. However, the fossil record demonstrates that whales have bones which in their ancestors could have been legs.

However, Darwin was right in a certain way. Recent analysis point out that whales are descendants of a group of semiaquatic organisms which used to feed themselves with their mouths opened. Molecular biology studies show that Darwin was only mistaken about the animal he associated whales with; It wasn't a bear population as he suggested, but of hippos, from about 50 million years ago.

In fact, current species and their adaptations are the result of a history of random variations in individuals and of environmental changes. For instance, birds' feathers could be considered the result of a selection process bent towards making flight easier (Fig. 1.19). Even though, studies performed on fossils show that the first feathered organisms were little running reptiles, whose feathers allowed them to survive and reproduce in a cold environment.

Throughout time, feathers also meant an advantage to survive and reproduce for some flying birds. The fossil register and biodiversity show pterodactyls and bats do not need feathers to fly. There are also some birds that do not fly even though they have feathers, such as penguins and ostriches.



FIG. 1.19 Wings observed in several vertebrates and fossils have had different functions.



→ HANDS ON

The egg and the hen

Ancient Greek philosophers presented their disciples a famous causality dilemma to reflect on the origins of life and the universe. They used to ask them: which came first, the chicken or the egg? Think about different answers for this dilemma and write them down.

In teams and with your teacher's help answer the following questions:

1. Why do you think philosophers used this question to make their disciples reflect about the origins of life and the universe?
2. Evolutionary research shows that birds come from some kind of ancient reptile group. How can you explain that a bird could hatch from a reptile's egg? Look for information about the evolution of birds. Draw a diagram to explain their adaptation process.

Compare your answers with the rest of the group.

Kells

21

CONTENT DELIVERY

Start: Give students oral instructions so that they draw a whale. For example: Draw a line...then, in the back, draw a fin...etc.

Development: Students should give their presentations on whales' evolution.

Closing: Have them self-evaluate their plan, organization, delivery.

Homework: Set students in groups of four. Ask them to plan and organize a presentation about medicinal plants used in Mexico. They should make a plant album to show it to their partners. They should also include its name, use and place of origin.

SKILLS DEVELOPMENT

Interpersonal skills: Working as a team member.

Metacognitive skills: Planning, organizing, delivering, monitoring.

EVALUATION OF CONTENT

See the Teacher's Guide projects rubrics on page 132. Check also how they evaluate each other's work.

SESSION INFORMATION

Week: 5

Sessions: 25, 26

Expected learning outcome: Identify the importance of herbal studies, as an indigenous culture contribution to science.

CONTENT DELIVERY

Session 25

Start: Ask students if at some point in their lives anyone gave them a tea or herb to cure them. Elicit for answers. (The traditional medicine day is on October 22nd)

Development: Set students in groups of four. Ask them to plan and organize a presentation about medicinal plants used in Mexico. They should make an herb book. They should include its name, use and place of origin. Students will present their findings.

Closing: Students should play the “doctor” and “patient”; the doctor should prescribe one of the herbs or teas.

Session 26

Start: Students should name three medicinal plants that were mentioned the previous session. Ask at random.

Development: Students should read page 22. In teams, they will draw the key information on the text.

Closing: Students should show their drawings in whole class.

Recognizing how Mexican Herbalism has Contributed to Science and Medicine Worldwide

→ Expected Learning

Identify the importance of herbal studies, as an indigenous culture contribution to science.

→ Research

Look for information about medicinal plants used in Mexico. Find out for which diseases they are being used. You can start with chamomile, epazote, bougainvillea, eucalyptus and mullein.

Discuss with your team and then, together with your teacher, create a proposal on how to obtain more information about the usage of medicinal plants in your community. How would you try to find this information? Who could you ask about these plants, their uses and origins?

GLOSSARY

Active ingredient. It is a substance which produces perceivable effects in living things. These effects can help in the treatment of diseases.

Mexico's herbology is a clear example of how ancient wisdom can contribute to science and worldwide medicine. The different indigenous groups use a wide variety of plants and animals as food, building materials and medicines. This knowledge comes from constant interaction with nature from over ten thousand years.

Since the conquest of Mexico, indigenous cultures have kept constant cultural exchange with European, Arab and African influences. Bernardino de Sahagún, Martín de la Cruz and Juan Badiano kept part of our ancestors' wisdom and so, knowledge has survived through time (Fig. 1.20).

FIG. 1.20 The Badiano Codex describes the medicinal herbs and plants used by the Aztecs. It was translated from Nahuatl to Latin in 1552.



Traditional knowledge keeps playing a very important role in the discovery of new drugs. Large companies in the pharmaceutical industry invest a lot of money on research in indigenous communities so they can systematically find out more about plants with healing properties.

When a plant, which is commonly used among the community is found, it is collected and taken to a laboratory for its analysis. The **active ingredient** is identified, that is, the substance with a biological effect that contributes to treat the disease and may be used eventually in a drug. This is merely the beginning of a series of experiments and trials to determine the effectiveness of the new product and the possibility to test it on humans.

Mexico's cultural wealth is as large as its biodiversity. Mexico has 62 indigenous towns, each one with different ways of thinking about usage of nature. This biodiversity and natural heritage mean there is more than one way to fully understand the environment, and when it comes to medicinal plants, there are over 4,500 registered plants just for healing properties. This places Mexico as the second largest country with registered medicinal plants, China is at the top of the list with 5,000 registered plants.

22

SKILLS DEVELOPMENT

Critical thinking skills: Summarizing, remembering, experimenting.

Bodily/Kinesthetic skills: Roleplaying.

EVALUATION OF CONTENT

Evaluate their sample (if they took it to the class) and that the information is complete and relevant. See the Teacher's Guide projects rubrics on page 132.

Evaluate if their drawing contains key information.

SESSION INFORMATION

Week: 5

Sessions: 26, 27

Expected learning outcome: Identify the importance of herbal studies, as an indigenous culture contribution to science.

CONTENT DELIVERY

Start: Students will work in pairs. One of them will read the text on page 23 Biodiversity and bio prospecting. The other will listen to his partner's report.

Development: Once they tell or listen to the article, they will create a company that commercializes medicinal plants. They should include the sales plan, label, logo, and the products to sell.

Closing: At random, select three or four teams who present their companies.

Reading

Biodiversity and bioprospecting

Recent research and discoveries

The scientific and technological progress in medicine throughout a great part of the 20th century made indigenous knowledge despised and relegated in many places.

Magic-religious relationships associated this particular way of healing with an inefficient practice without a future. However, in recent years, researchers have recognized the economic potential of traditional knowledge. Companies have financed investigations into remote regions to search for new sources of medicine, food supplies and even cosmetics.

This kind of research is part of what is known as bioprospecting, a scientific area that works towards the identification of commercially useful properties of the species. These studies are abundant in high biodiversity zones (Fig. 1.21).

Institutions such as the Universidad Nacional Autonoma de Mexico and the Instituto Politecnico Nacional have been working intensely for decades on this specific area, not only for its commercial value, but as part of Mexico's cultural wealth. These institutions have the opportunity to share their experience in research together with companies interested in bioprospecting.

However, bioprospecting brings up some problems as the way to share benefits. For example, if a plant has a great economic potential, how

should the indigenous community be paid? What if other communities have the plant? What rights does the company have? Who gets the economical benefits?

The answers to these questions are very important so that indigenous groups obtain benefits from sharing their knowledge. But this is a troublesome situation to calculate. How can a group be paid for years and years of learning, relating to nature and keeping knowledge? Should a price tag be placed on culture?

Source: Hayden, C. (2005). "What is the collective (for)?" Bioscience, exchange, and the politics of benefit-sharing (comp.) Seminario de posgrado, México, UNAM.



FIG. 1.21 Although bioprospecting requires mainly lab work for sample recollection, it is still a job that interacts directly with nature.

A great number of Mexicans use only medicinal plants for everyday treatments, such as colds, intestinal infections or headaches. Also, a high percentage of the population combines the use of medicinal plants with allopathic treatment. In recent years the use of traditional medicine from other countries, such as Chinese alternative therapies, have become more popular.

In contrast to other countries, herbology in Mexico is legal, and traditional medicine is recognized and incorporated in the country's public health system. In some states of the Mexican Republic, there are hospitals where allopathic and traditional doctors work together. This official recognition to herbology allows thousands of families to live on growing and trading medicinal plants. This legal recognition is very important to keep a tradition alive, which has provided very important facts for health care and still has a lot of potential.

Kells

23

SKILLS DEVELOPMENT

Critical thinking skills: Creating.

Speaking skills: Information gap sharing.

EVALUATION OF CONTENT

See the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 5

Sessions: 28, 29

Expected learning

outcome: Explain the importance of technological development in microscopes in the knowledge of microorganisms and the cell as a unit of life.

CONTENT DELIVERY

Start: If possible, show students some pictures of objects under the microscope. If not possible, ask them to draw how they imagine a leaf looks under it.

Development: Students should read page 24 and create a quiz to interview other partners.

Closing: Elicit for questions and answers to do a comprehension-check drill.

Homework: Students should bring the necessary materials to do the experiment described on page 25.

→ Expected Learning

Explain the importance of the technological development in microscopes in the knowledge of microorganisms and the cell as a unit of life.

Implications of the Discovery of the Microscopic World in Health and in the Knowledge of the Cell

→ Research

Microscope and imagination

Work in teams, and interview your relatives and friends. Ask them if they have ever used a microscope in order to draw a microscopic organism. If they have never seen one, ask them to imagine what one would be like. Keep the drawings.

The microscope is probably the best example of how a technological invention transforms our understanding of nature. Towards the XVII century, crystals that increased the size of images up to 10 times, were used to amaze people in parties and gatherings, with the astonishing aspect of fleas and other insects, which could not be seen in detail with the naked eye.

The invention of the microscope is attributed to Zacharias Janssen and his son. Both experimented with aligned lenses inside a tube and discovered that nearby objects could be observed with higher magnification.

Anton van Leeuwenhoek is more recognized in microscope manufacturing than the Janssens. This is because Leeuwenhoek used his microscope to analyze the most diverse materials, and by doing so, he saw for the first time the smallest living thing in Nature. New worlds appeared before Leeuwenhoek's avid eyes. A water drop could contain thousands of small animals. His drawings show he was able to observe bacteria, his blood globules and his saliva. He could see new things no one had ever imagined (Fig 1.22).

Members of the Royal Society requested that Robert Hooke personally review the data and repeat Leeuwenhoek's experiences. Hooke confirmed all observations made by Leeuwenhoek. One day, Hooke observed a piece of cork, and realized it had a series of structures similar to cells. He decided to name these new structures, with a name that reminded him of their form, and he called them cells.



FIG. 1.22 Leeuwenhoek microscope.

In 1839, Jakob Schleiden and Theodor Schwann published what is known as Cellular Theory. They made observations of diverse tissues of plants and animals using a microscope. Their studies allowed them to establish one of the fundamentals of Biology: every living creature is formed by cells.

Thus, once it has been established that:

- The cell is the unit of life.
- Inside each cell vital functions are performed.
- Every living creature is formed by one or several cells.

The next step in the investigation was to understand how a cell is internally organized (Fig. 1.23). For that, it was necessary to have more powerful microscopes and to develop a new field of study known as cellular biology.

24

SKILLS DEVELOPMENT

Critical thinking skills: Formulating questions.

EVALUATION OF CONTENT

They should be able to explain the importance of microscopes to understand how microorganisms act.

In the Lab

The Smallest living things

The purpose of this activity is to get you familiarized with the use of a composed microscope.

Materials:

- One microscope (Fig. 1.24).
- Several cover slips and microscope slides.
- A dropper.
- Observation materials.

Observation materials collection:

Work in groups of 5 or 6 members. Collect leaves, insects (in plastic bags), pieces of cork, bread or tortilla with fungus, water from a vase, water from a pond, and running water (in small jars).

Take a drop from collected water with the dropper and carefully put it on a microscope slide. Carefully incline the cover slip so that the water spreads out.

Try to avoid bubble formation. This way the water drop will stay between the two glasses. Use some paper to dry any water spills.

To watch something solid like a leaf, a fly's wing or leg, or some of the other collected materials, first you have to get a piece that fits the size of the slides.

Carefully place the cover slip. Never watch something which has not been correctly prepared. Ask your teacher for help.

Composed microscope observation

The microscope must be placed on a firm table; do not try to move it some other place, unless you receive instructions from your teacher on how to do it.

Prepared material is placed on the plate with the cover slip facing up, and fixed with pliers. Approach the lowest objective lens to the eyepiece tube. This can be done if you watch the microscope from the side while moving the coarse focus knob. Bring the objective as close as possible, without forcing the knob. Now watch inside the eyepiece tube and try to focus with the fine focus knob until you can see the material clearly.

Perform your observations and do not forget to draw them in your notebook; always write data from the sample, so you know which one corresponds to the drawing. Now, try other objectives to observe different amplifications and look at other prepared materials.

- Draw conclusions out of your observations.
- Which material had more microorganisms?
- What differences did you notice among microorganisms and structures of plants and animals? Explain your answer.
- Compare your observations with those from other teams. Are they alike? Did anybody notice something different? Yes? No? Why?
- Compare your observations with the drawings. Are they alike? Yes? No? Why?

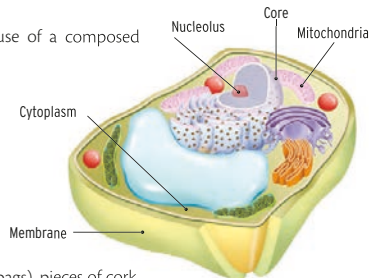


FIG. 1.23 Fig. 1.23. The cell and its main structures.



FIG. 1.24 Composed microscope.

SESSION INFORMATION

Week: 5

Sessions: 29, 30

Expected learning

outcome: Explain the importance of the technological development in microscopes in the knowledge of microorganisms and the cell as a unit of life.

CONTENT DELIVERY

Students should do the experiment and answer the questions on page 25.

25

Kells

SKILLS DEVELOPMENT

Naturalist skills: Observing details, categorizing, comparing and contrasting.

Critical thinking skills: Observing, analyzing.

Interpersonal skills: Working as a team.

EVALUATION OF CONTENT

See the Teacher's Guide projects rubrics on page 132.

Kells

25

SESSION INFORMATION

Week: 6

Sessions: 31, 32

Expected learning

outcome: Identify false ideas and beliefs about some diseases caused by microorganisms, based on scientific facts.

CONTENT DELIVERY

Start: Ask students why they think they get the flu, a stomachache or a headache. They should write their guesses on the board.

Development: Students should read page 26. Help them with vocabulary as necessary.

Closing: Students should decide what explanation they can give to the diseases they first mentioned.

Homework: Students should take cardboard, markers, ruler to make a graph next class.

→ Expected Learning

Identify false ideas and beliefs about some diseases caused by microorganisms, based on scientific facts.



FIG. 1.25 Louis Pasteur (1822-1895), initiator of the study of microbes

GLOSSARY

Vaccine. It is a biological preparation that causes the production of the necessary agents that help prevent or ameliorate a future infection of a specific disease.

Critical Analysis on Arguments about the Causes of Microbial Diseases

Many people associate the word “microbe” and “bacterium” with diseases. Until 1870, microbes were a mystery to science. Although they had been described since 1650 by Leeuwenhoek, scientists doubted that they were living things. What did they eat? What was their origin? How did they reproduce? What was their role in nature?

The key to understanding that microorganisms are living things began with the study of the products of their metabolism, one of the early achievements of a French chemist named Louis Pasteur (Fig. 1.25). Pasteur showed that microscopic organisms are living things that have a very complex metabolism.

Pasteur also invented the process known now as pasteurization, which allows the preservation of products by eliminating the microorganisms that can decompose them (Fig. 1.26).

Pasteur was the first man in history who considered the possibility that infectious diseases were caused by microorganisms. He suggested doctors wash and boil medical equipment, and even designed a machine to sterilize it.

Eventually, Pasteur demonstrated that cholera and anthrax are caused by microorganisms. He made careful studies to cultivate these germs and thus he could develop a procedure to make **vaccines**.

Pasteur also developed a theory that says that all infectious diseases originate in a microorganism able to spread among people. It is now known that many diseases are caused by microorganisms that invade the body. This is how the study of diseases began, by considering that if the cause was identified, a remedy could be found, or even better, the disease could be prevented. It is important to note that this discovery also helped to understand that certain conditions allow the existence of microorganisms that can cause disease, making clear the need to take hygienic measures.

There is a set of procedures to identify the cause of a disease, called “Koch’s postulates”:



FIG. 1.26 It is possible to store pasteurized milk in airtight containers.

26

SKILLS DEVELOPMENT

Critical thinking skills: Comparing and contrasting, problem solving, changing point of view.

EVALUATION OF CONTENT

They should explain the importance of microscopes to explain microorganisms and the cell as a unit of life.

➔ Research

Discuss with your classmates:

- Have you ever been ill because of a microbe? Explain your answer.
- What steps are recommended to prevent diseases caused by microorganisms?
- Why does the risk of disease decrease if surgical material is sterilized?
- Do you know any methods of disinfection? Have you used them?
- How can you prevent the spread of a disease?
- Come to a conclusion and make a bulletin board in which you propose measures to prevent the risk of diseases caused by microorganisms.

1. Researchers observe healthy and sick bodies and compare them, if a certain kind of microorganism is found only in diseased bodies; they have a basis for believing that this organism may be the cause of the disease.
2. Microorganisms are isolated and grown in laboratories.
3. Then, an experiment is conducted in which the cultivated microorganisms are introduced into several healthy subjects and await the results. If the experimental subjects present symptoms of the disease, then it is considered that the microorganism is the cause (Fig. 1.27).
4. Microorganisms of the experimental subjects are isolated to make sure they are identical to those introduced in the experiment.

Once the cause is identified, there may be preventive measures to avoid contact with dangerous microorganisms or, in case of illness, eliminate its cause.

During the 20th century, scientists' work, according to Koch's postulates, allowed them to identify the causes of many diseases and enabled the manufacturing of drugs to fight them.

In 1979, Robin Warren noted that a small blue line (Fig. 1.28) was observed in tissue of patients with gastric ulcers. Gastric ulcers are wounds that occur in the interior of the stomach or in the upper part of the intestine. Warren had used a stain to see the tissues and that line drew his attention, so he observed closely and discovered that it was bacteria. He also studied the tissues of patients without ulcers and saw no visible bacteria in these cases.

In 1981, Barry Marshall began collaborating with Warren, trying to get a culture of the microorganism; it turned out to be quite a difficult job because they had to simulate the conditions of the human stomach. Once they obtained the culture, they had to introduce the microorganism in healthy organisms and see the effects. Barry Marshall decided to test it on his body and introduced

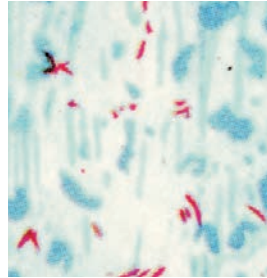
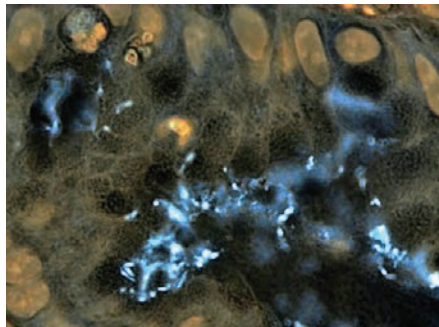


FIG. 1.27 Microscopic image of Koch's bacillus.

FIG. 1.28 The presence of blue 'lines' alerted Warren to the presence of certain bacteria.



27

SESSION INFORMATION

Week: 6

Sessions: 33, 34

Expected learning

outcome: Explain the importance of the technological development in microscopes in the knowledge of microorganisms and the cell as a unit of life.

CONTENT DELIVERY

Start: Students should do the research stated on page 27 in groups of five members.

Development: Students should take cardboard, markers, and ruler. Then students should make a graph with the answers of their findings.

Closing: In teams, they will present the results of their poll.

Homework: Students should do research on Barry Marshall and Robin Warren research on gastric ulcers.

SKILLS DEVELOPMENT

Critical thinking skills: Analyzing, summarizing.

EVALUATION OF CONTENT

They should answer the questions on page 27.

SESSION INFORMATION

Week: 6

Sessions: 35, 36

Expected learning

outcome: Explain the importance of the technological development in microscopes in the knowledge of microorganisms and the cell as a unit of life.

CONTENT DELIVERY

Start: Students should define gastric ulcer with a drawing or oral explanation.

Development: In teams, students will perform an interview to Marshall and Warren on gastric ulcers. Two of them will play the scientists while the other two will play the interviewers.

Closing: Students should write the contribution these two scientists gave the world.



FIG. 1.30 Doctors Barry Marshall and Robin Warren, Royal Perth Hospital, in 1984.

bacteria in his own stomach to produce an ulcer, and remove it later with the treatment they were proposing. This experiment was successful, since after the ulcer occurred, they were able to cure it with the treatment.

There was also the widespread idea that bacteria could not live in an acidic environment, and that ulcers were a problem related to the patient's age and eating habits and could be controlled by reducing the secretion of acid in the stomach.

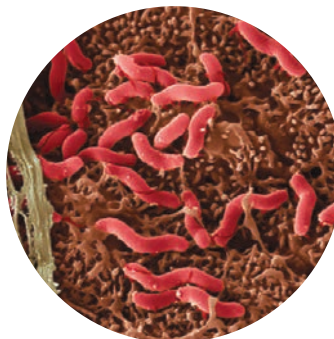
Eventually, the scientific community was convinced and now ulcers are treated as an infection due to *Helicobacter pylori*, and the use of targeted therapies to reduce acid secretion has decreased (Fig. 1.29).

In 2005, Robin Warren and Barry Marshall (Fig. 1.30) received the Nobel Prize in Physiology and Medicine for their contribution to the medical knowledge of the causes of gastric ulcers.

SO FAR YOU HAVE LEARNED THAT...

- Knowledge about the environment has been used to meet human needs.
- Different towns in the world have identified the medicinal properties of plants, and herbology constitutes a form of health care for many people today.
- The use of the microscope allowed us to identify microorganisms that cause several diseases, and brought about important changes in medicine.
- Science and technology advance thanks to the doubts that arise around everyday situations or processes.

FIG. 1.29 *Helicobacter pylori* was identified and given a name in 1989.



➔ Research

Analysis of the information

1. With your teammates, read the text again on Warren and Marshall's work on gastric ulcers. Identify how Warren and Marshall followed Koch's postulates. Draw a two-column table, in the first column write Koch's postulate and in the second one, what Warren and Marshall did to comply with that postulate. You can search Koch's postulates for this work in other books or on the Internet.
2. What ideas did the scientific community have about the causes of gastric ulcers?
3. Explain how Warren and Marshall's work demonstrates that the treatment of peptic ulcers with antacids, is based on a misconception about the disease.
4. Write the answers in your notebook and following your teacher's instructions, share your answers with other teams.

Kells

28

SKILLS DEVELOPMENT

Bodily/Kinesthetic skills: Acting.

Critical thinking skills: Summarizing.

EVALUATION OF CONTENT

Students should explain how the microscope helped Warren and Marshall reach their remarkable discovery.

Project

Towards Building a Responsible and Involved Citizenship

Suggested questions

What are the contributions of indigenous cultures to the knowledge and care of biodiversity in your community?

What changes has biodiversity suffered in our country in the past 50 years? To what can it be attributed?

→ THE CHALLENGE

Develop a project about a theme which you find interesting or has called your attention. You have to use your knowledge and abilities to:

- Raise questions that help orient your research.
- Look for information in different media to answer your questions.
- Select, organize, and analyze relevant information to construct your answers.
- Share your answers with other people by presenting your ideas and supporting them, as well as your conclusions.

1 Introduction

In this unit you saw the characteristics of living things and their relationships as part of ecosystems. You learned that some activities human beings perform endanger biodiversity, and damage the ecosystems. You also learned how the study of living things has been of great help in improving people's lives, especially with the discovery of the microscope and organisms responsible for diseases.

To end this section, you must create a project in which, besides applying your acquired knowledge, you actively participate in research and develop your abilities to observe your surroundings, look for existing problems and analyze information.

2 Think of a project

We propose doing a project that could let you appreciate how indigenous cultures have contributed to the knowledge and care of biodiversity (Fig. 1.31), or how the place where you live has changed in the last 50 years. In both cases your teacher will help you.

The starting point in any project is an investigation question, so discuss with your classmates what you would like to investigate. While asking your question, consider the following: Does it have to do with preserving biodiversity? Do you have information to start?

What you have learned in this unit could help you in the development of your project (Fig. 1.32). Your teacher will let you know how much time you have to develop it, and the way to present it.



FIG. 1.31 Species of Mexican flora, like cactuses, have been used and consumed by indigenous cultures for centuries.

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SESSION INFORMATION

Week: 7

Session: 37

Expected learning outcome: Apply unit content to develop a project.

CONTENT DELIVERY

Start: Explain the reasons to do the experiment and how you will evaluate it (follow the Teacher's Guide projects rubrics on page 134)

Development: Students should read what the project is about. They should plan, organize and deliver a draft.

Closing: Help teams accordingly and check their drafts.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing and delivering.

EVALUATION OF CONTENT

Check their drafts.

SESSION INFORMATION

Week: 7

Sessions: 38 – 42

Expected learning

outcome: Apply unit content to develop a project.

CONTENT DELIVERY

Start: Briefly explain what you will evaluate in their presentations: Relevant, clear information, visuals, some comprehension-check questions, further information, language use and collaborative work.

Development: Students should give their presentations. Assign time according to your class length. Help as necessary.

Closing: Students should ask their 5 comprehension-check questions to their partners. Then, ask them to self-evaluate their presentations using the same presentation parameters described in the rubrics.

FIG. 1.32 In this section you have learned about biodiversity and why it is important to take good care of it.



Now, decide how you are going to work, and what information you will look up. What sources of information will you use? What will each team member do? How are you going to present your information? You can make a chart outlining the activities to control what you are doing and how you are going to reach your goal.

3 Perform

Work on the activities included in your outline. Look for information, discuss it, analyze your progress, talk about things that called your attention, your doubts and the problems you have overcome to reach your goal.

Remember it is very important to take notes on your progress and have the information classified and accessible. Analyze the information and see if you have reached your goal: Do you have a satisfactory answer for your question? What is missing?

4 Share

Share your investigation with your classmates and teacher, and get feedback about your work. Pay attention to the way you present it, make it attractive and clear so the others will value the information. Be creative and use your abilities to make a successful presentation which will show what you have learned.

5 Test

Following your teacher's instructions, do an evaluation, participating in the discussion of the projects and their results. Were you able to answer their questions? Did you find the correct information? Was the presentation clear and attractive?

It is also important to talk about the way you worked: Did each of the team members collaborate properly? Did they do their assigned task? Did the way tasks were distributed work out? Now that you have your results, what would you change? How could you improve your work?

Think about each project and individual participation. Write your personal reflections in your notebook, and try to improve the less favorable aspects.

SKILLS DEVELOPMENT

Reading skills: Scanning.

Critical thinking skills: Formulating questions.

Listening skills: Understanding the message.

Metacognitive skills: Delivering content, self-monitoring, self-evaluating their presentation.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Evaluation

1. Some explorers observe a tube-shaped object moving at the bottom of the sea. The object changes the direction it moves if direct light is applied on it. The explorers collect several tubes to study them in the laboratory.

Which of the results demonstrate that the object is a living thing?

- a) The object changes color when heated.
 - b) The external part of the object is rough.
 - c) The object is formed by cells.
 - d) The internal part contains fish remains.
2. What may happen in an ecosystem if the herbivorous population decreases? Choose one of the following options.
- a) The plant population decreases because they are not needed by other organisms.
 - b) The carnivorous population decreases because there are not enough resources to eat properly.
 - c) The carnivorous population increases to respond to the new environment conditions.
 - d) The plant population increases because new and more resistant species appeared.
3. Around 1980, there was a settlement of a human population near a pine and oak woods. A scientist studied the changes in the size of the population of different organisms in the woods. His results are shown in the following graph:

Type of organism	Number of individuals in 1980	Number of individuals in 2010
Pine Trees	403	252
Oak Trees	711	506
Eucalyptus Trees	0	334
White tail Deer	215	None seen in three years
Coyotes	17	35
Goats	0	54

Compare the facts from the graph, and explain which are the main changes that can be observed in the food chain in the woods?

- a) Considering the information the scientist found in this case, what can you say about the change in biodiversity in this region? Has it increased or decreased? Support your answer.
- b) What measures would you take to control the increase of the coyote population?
- c) Review the text about the eucalyptus tree in Mexico and answer: Do you think it is right that the pine and oak trees in the woods were replaced with eucalyptus trees in this example? Support your answer.

31

SESSION INFORMATION

Week: 8

Sessions: 43 - 48

CONTENT DELIVERY

Start: Students should answer to pages 31 and 32 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 114 to 116 along with the answer key, page 117.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135, 136.

SKILLS DEVELOPMENT

Metacognitive skills: Monitoring, planning, organizing.

EVALUATION OF CONTENT

Students should write down what they should improve doing for following units. Consider their portfolio follow up, the exam (on pages 31, 32 students book and pages 114 – 117 Teacher's Guide).

SESSION INFORMATION

Week: 8

Sessions: 43 - 48

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 31 and 32 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 114 to 116 along with the answer key page 117.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 143, 144.

4. A community has decided to develop some measures to preserve their woods. Among these measures we can hunt and get rid of dogs and cats that may be living within the area that is considered to be preserved. Some people are against this measure. Reflect and answer:
 - a) How can dogs and cats affect the area?
 - b) What would be the reasons for allowing dogs and cats to live in the woods? Support your answer.
 - c) Could it be possible to propose an answer that allows the preservation of the woods without having to get rid of the dogs and cats? Yes? No? Support your answer.
5. What does biological evolution state? Choose the correct option among the following ones:
 - a) That living things improve their functions throughout time.
 - b) That the human being is the most adapted among primates.
 - c) That living things depend on the conditions of the environment.
6. Which of the following examples is one of the microscope's contributions to learning about living things?
 - a) The discovery that all living things need energy to carry out their functions.
 - b) The observation that all living things are formed by one or more cells.
 - c) The identification of plants to cure different kinds of breathing illnesses.
 - d) The analysis of toxic substances that some living things produce in the laboratory.
7. Some scientists suspect that a certain disease is produced by a microorganism found only in the tissues of sick animals. What else do scientists have to do to prove that the microorganism is the one that causes the disease?

32

SKILLS DEVELOPMENT

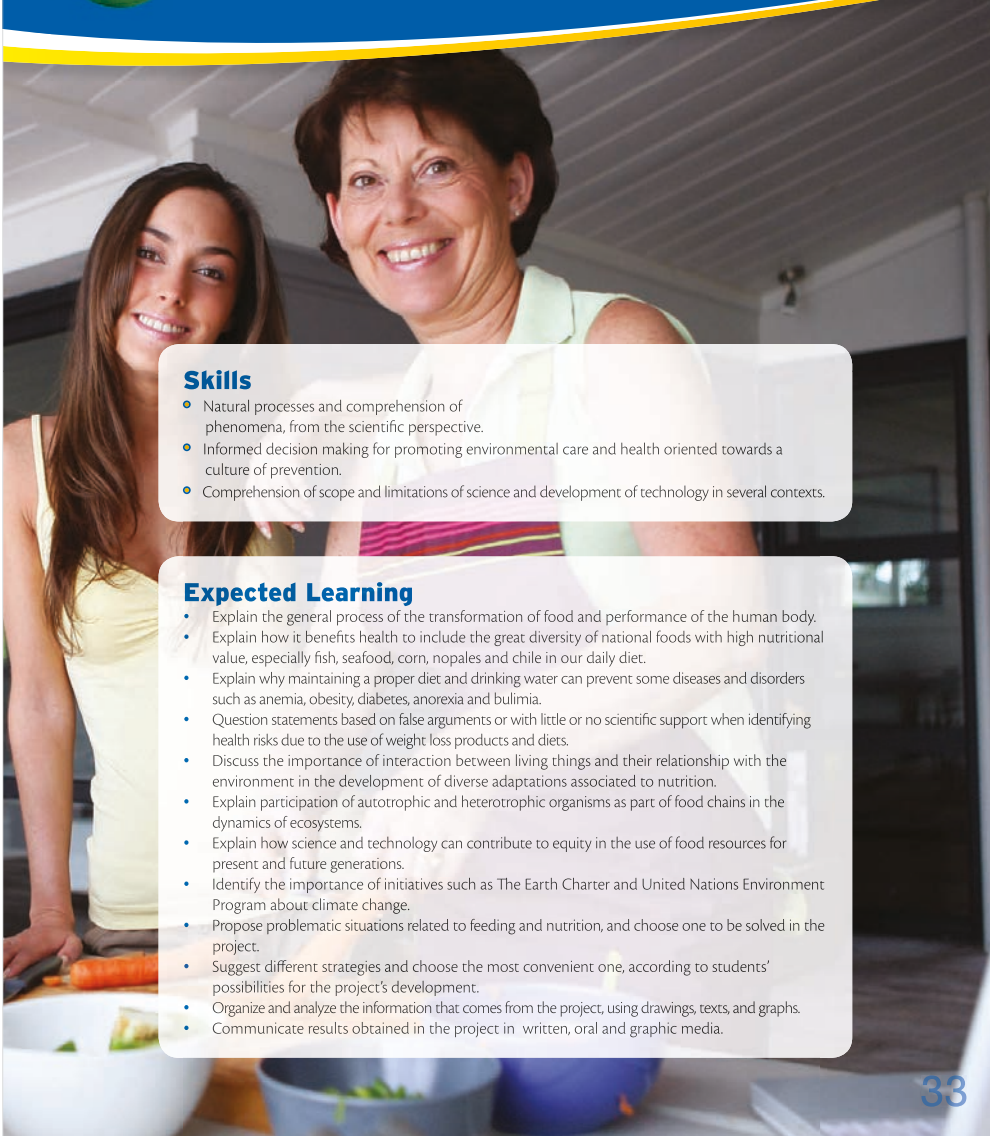
Metacognitive skills: Monitoring, planning, organizing.

EVALUATION OF CONTENT

Students should write down what they should improve doing for following units. Consider their portfolio follow up, the summative assessment (Teacher's Guide pages 114 to 116).

UNIT 2

Nutrition as the Basis for Health and Life



Skills

- Natural processes and comprehension of phenomena, from the scientific perspective.
- Informed decision making for promoting environmental care and health oriented towards a culture of prevention.
- Comprehension of scope and limitations of science and development of technology in several contexts.

Expected Learning

- Explain the general process of the transformation of food and performance of the human body.
- Explain how it benefits health to include the great diversity of national foods with high nutritional value, especially fish, seafood, corn, nopales and chile in our daily diet.
- Explain why maintaining a proper diet and drinking water can prevent some diseases and disorders such as anemia, obesity, diabetes, anorexia and bulimia.
- Question statements based on false arguments or with little or no scientific support when identifying health risks due to the use of weight loss products and diets.
- Discuss the importance of interaction between living things and their relationship with the environment in the development of diverse adaptations associated to nutrition.
- Explain participation of autotrophic and heterotrophic organisms as part of food chains in the dynamics of ecosystems.
- Explain how science and technology can contribute to equity in the use of food resources for present and future generations.
- Identify the importance of initiatives such as The Earth Charter and United Nations Environment Program about climate change.
- Propose problematic situations related to feeding and nutrition, and choose one to be solved in the project.
- Suggest different strategies and choose the most convenient one, according to students' possibilities for the project's development.
- Organize and analyze the information that comes from the project, using drawings, texts, and graphs.
- Communicate results obtained in the project in written, oral and graphic media.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing a studies plan.

EVALUATION OF CONTENT

Students should briefly plan how they will work studies content.

SESSION INFORMATION

Week: 9

Session: 49

Expected learning outcome: Explain the general process of transformation and performance in the human body.

CONTENT DELIVERY

Start: Ask students for the definition of nutrition. Elicit for answers. Reach a common definition.

Development: Students should write down the final project presentation date, rubrics to evaluate the unit and projects, and other relevant information regarding the unit you consider important.

Closing: Students should be set in groups of four to develop projects. It is advisable that you form the teams to prevent students from being left out. Project preparation: Students will be presenting information about the digestive system. They should read pages 34 – 36 and do any further research they need to give a presentation; divide the content information so that each team presents a segment. Ask for visual material and prepare a quiz. They should be able to follow their partners' presentations and later respond the quiz.

SESSION INFORMATION

Week: 9

Sessions: 50, 51

Expected learning

outcome: Explain the general process of transformation and performance in the human body.

CONTENT DELIVERY

Start: Write down key questions about the digestive system.

Development: Students will be presenting information about the digestive system. They should read pages 34 – 36 and do any further research they need to give a presentation; divide the content information so that each team presents a segment. Ask for visual material and prepare a quiz. They should be able to follow their partners' presentations and later respond the quiz. Students should give their presentations. Help accordingly. Get ready with a poster or drawing in case they do not take any material.

Closing: Dictate your quiz questions or give them copies of it.

→ Expected Learning

Explain the general process of transformation and performance of the human body.

GLOSSARY

Nutrient. Any chemical element or compound needed for the good functioning of living things which has to be consumed in a daily diet.

Relationship Between Nutrition and the Performance of the Human Body

All of the activities you do during the day require energy: run, play, study, clean the house and even rest. Your body also needs it to perform many other functions we are not aware of, but are fundamental to keeping us alive: keeping the heart and lungs functioning, protecting from diseases, and even maintaining body temperature.

Besides energy, your body also needs to get materials to keep you growing and recover those consumed in everyday life. For instance, think of your hair that grows, falls, and grows again, or nails that you have to cut periodically; almost all your body parts need to be constantly renewed, like the skin or components in your blood. Other materials are disposed of, such as, sweat, saliva, mucus and urine, and are also essential to keeping your body functioning well. The materials and energy that you require are obtained from substances called **nutrients**.

The Digestive System

Nutrition is the supply of materials, required by living things to stay alive and includes all the processes that involve obtaining the nutrients that come from food. Nutrition is not an easy task, it requires breaking down food that you eat and dividing it through a process is called **digestion**. This is the only way nutrients can be absorbed through the blood to reach all the cells in the body.

The digestive system is made up of different parts: a tube that includes the mouth, esophagus, stomach and small and large intestines; as well as the liver, pancreas and gallbladder. They are in charge of the chemical processes needed to digest food and absorb nutrients. (Fig. 2.1). Almost all along the tube, or digestive tract, there is a muscular wall that conveys food, pushing it by means of contractions and strains called **peristaltic movements**.

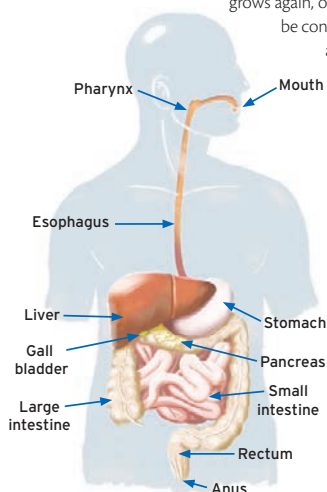
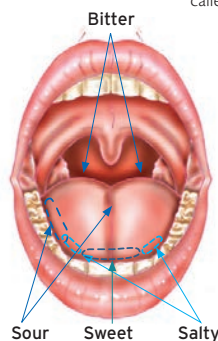


FIG. 2.2 The digestive system is formed by a tube called digestive tract and specialized organs.

FIG. 2.1 The different types of tongue flavor receivers are found in specific parts of the tongue. Notice, that the sweet flavor is found almost at the top of the tongue. This could be related, for example, to the way you eat ice cream.



The mouth, more than a mill.

Chewing takes place in the mouth, it mixes up the food and lets us taste the different components. Moreover, when you have a sandwich, you can recognize the taste of bread, ham, mayonnaise, tomato, and onion.

There are four kinds of **receivers** in our tongue, each one is specialized in detecting a different kind of flavor: salty, sour, bitter or sweet (Fig. 2.2). The tongue's receivers interact with smell by building a variety of food flavors.

34

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts.

EVALUATION OF CONTENT

According to the quiz result and follow the Teacher's Guide projects rubrics on page 132.

Human beings are **omnivorous** and can eat different types of food that are a source of nutrients: different kinds of meat, vegetables, fruit, even insects. In this vast diversity, our sense of taste helps us discriminate flavors that are healthy from those potentially hazardous, like rotten food.

→ HANDS ON

The tongue's tasks

Besides detecting flavors, the tongue has other functions. Do the following activity to detect other functions.

Procedure:

- At home, get food from the kitchen; have your notebook on hand.
- Take a bite and chew it. Pay attention to your tongue's movements and to what happens to the piece of food.
- Reflect on the purpose of those movements, share your reflections with your classmates and together make a list of functions that you found for the tongue's movements in the chewing process.

GLOSSARY

Glands. Organs specialized in the production of diverse substances and secretions. Glands are classified as endocrine and exocrine.

Endocrine glands release substances into the blood stream, and Exocrine glands secrete their products on the outer surface of the body.

Chewing is the first step of digestion. Its purpose is to fragment food into small pieces, which are easier to handle for the rest of the digestive system. It also mixes food with the help of saliva produced in various **glands** connected to the mouth.

Saliva starts the chemical digestion of food by means of substances that specialize in degrading sugar in the bread and vegetables of a sandwich, for example. In addition, it has some antibiotics which act as a front line defense against microorganisms that cause diseases. Finally, another function of saliva is lubricating food so that it can go through the pharynx and the esophagus better.

Pharynx and esophagus, pass-through.

The pharynx and esophagus are pass-through organs. In the pharynx there is a connection to the respiratory system, which allows the sense of smell to intervene in the perception of flavors. In the esophagus, food is conveyed to the stomach by means of peristaltic movements.

The stomach, the most corrosive place in the human body.

The main function of this organ is to process food mashed up in the mouth, and pass it on, little by little, to the small intestine. Digestion of protein, one of the most important nutrients for your body, starts here. Protein is fragmented by hydrochloric acid and other substances secreted by the stomach walls. Hydrochloric acid is one of the most corrosive substances found in nature, which is why the stomach must protect itself with a thick coat of mucus.

SESSION INFORMATION

Week: 9

Sessions: 52, 53

Expected learning

outcome: Explain the general process of transformation and performance in the human body.

CONTENT DELIVERY

Start: Write down key questions about the digestive system.

Development: Students will be presenting information about the digestive system. They should read pages 34 – 36 and do any further research they need to give a presentation; divide the content information so that each team presents a segment. Ask for visual material and prepare a quiz. They should be able to follow their partners' presentations and later respond the quiz. Students should give their presentations. Help accordingly. Get ready with a poster or drawing in case they do not take any material.

Closing: Dictate your quiz questions or give them copies of it.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts.

EVALUATION OF CONTENT

According to the quiz result and follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 9

Session: 54

Expected learning

outcome: Explain the general process of transformation and performance in the human body.

CONTENT DELIVERY

Start: Write down key questions about the digestive system.

Development: Students should give their presentations. Help accordingly. Get ready with a poster or drawing in case they do not take any material.

Closing: Dictate your quiz questions or give them copies of it.

Project preparation:

Organize 7 teams. Each team should present one of the following topics: fish, seafood, corn, nopales, chili, avocado, and coffee including nutritional information, production in Mexico, Mexican dishes that include the product and best season as well as a summary from pages 37 and 38. Besides, they should prepare a Mexican gastronomy exhibit with a sample of a dish with the food they present. Follow the Teacher's Guide projects rubrics on page 132.

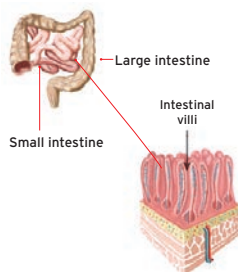


FIG. 2.3 The absorption of nutrients is performed in the small intestine by means of micro hairs, which are sprinkled with arteries and microscopic veins. Thus, nutrients pass directly to the blood stream, to be distributed to all the cells in the body.

The small intestine.

The absorption of practically all nutrients is performed in the small intestine with the help of two gland organs, the liver and the pancreas (Fig. 2.3). The liver produces bile, a green liquid that is concentrated in the gall bladder, which secretes it towards the intestine, where it helps digest fat.

The pancreas is the main source of enzymes that take part in the digestive process to help decompose food into its most simple components; all this takes place during the up-to-five-hour journey, along the 6.5 meters, of the small intestine.

Large intestine.

At the end of the small intestine (Fig. 2.3), the original food, practically devoid of all its nutrients, reaches the large intestine, which is divided into two sections: the colon and the rectum. The purpose of the first section is to absorb water. As water is extracted, residuals are compacted to form feces.

The journey through the large intestine is the slowest phase in the whole digestive process. It generally takes 24 hours, but the time can vary, depending on your diet and how well you are hydrated, among other factors. The large intestine also has a layer of bacteria which can be up to 2 centimeters thick. The largest concentration of this bacteria, known as intestinal flora, is harbored here. This flora feeds on residual nutrients and under normal conditions, it will not cause any discomfort. Finally, feces are pushed by peristaltic movements to the second section, the rectum, which compacts them more and stores them, till they are eliminated, through the anus. Throughout the whole process, nutrients contained in food, are released little by little, to enter the body and become part of its structure and functions.

Digestion of nutrients in the integral function of organs.

There is a whole hierarchy in the way energy and nutrients are assigned for the various functions in your life, this is the following order:

1. Survival
2. Repair
3. Growth
4. Reproduction

In the case of severe malnutrition, the body assigns all available nutrients towards survival. In other words, to the most vital basic functions. Energy, is more important than other nutrients; so, carbohydrates and fat are consumed first and once these are depleted, proteins are consumed affecting the body's integrity. During an illness or disease, it is important to be well nourished because the body requires more energy and nutritional substances for repair. When an illness lasts for a long time (months or years) it is followed by malnutrition and if it takes place in the early stages of growth, the result is short stature because the body stops growing.

Reproduction has a lower level in the hierarchy in the assignment of nutrients, so a pregnant woman must be nourished properly to help her face any eventual complications, thus reducing any risk to the baby's health.

36

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts.

EVALUATION OF CONTENT

According to the quiz result and follow the Teacher's Guide projects rubrics on page 132.

Benefits of Having a Vast Variety of Mexican Food with High Nutritional Content.

Corn varieties differ in features such as color, shape, size and texture of the grains, and length, thickness and density of the grains on the cob (Fig. 2.4). They also slightly differ in their nutritional content (e.g. colored varieties have a few more proteins than white ones), but more importantly, they have different humidity and temperature requirements, and are adapted to different climatic conditions.



→ Expected Learning

Explain how it benefits health to include the great diversity of national foods with high nutritional value, especially fish, seafood, corn, nopales and chili in our daily diet.

FIG. 2.4 There are many varieties of corn in our country.

Corn, as cereal, provides energy, but also provides calcium and some protein; beans, which are legumes, are capable of providing most of our body's protein requirements.

In Mexico, there are around 150 different kinds of chiles. Chiles are rich in iron, vitamins A and C, and the spiciness comes from a substance called capsaicin that activates heat receptors in the tongue. It has been speculated that this substance can increase the sensitivity of taste receptors, so food with chile truly has more flavor (Fig. 2.5).

Nopal comes from the stem with the plant of the same name. It is a cactus with numerous species distributed in several countries throughout America; however, Mexico is the only place where it is abundantly consumed as food, taking advantage of its high content of vitamins and dietary fiber (which gives it consistency). Nopal is one of the few species that can be grown successfully in arid zones and has the peculiarity that its stem and fruits (tunas) can be eaten. Nopal contains vitamin A, vitamin C and B-complex; some minerals such as calcium, magnesium, sodium, potassium and iron, in addition, its high fiber content, promotes digestion.



FIG. 2.5 Chiles are rich in iron and vitamins A and C; however, doctors recommend consuming them in moderation.

Kells

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SESSION INFORMATION

Week: 10

Sessions: 55 - 57

Expected learning

outcome: Explain how it benefits health to include the great diversity of national foods with high nutritional value, especially fish, seafood, corn, prickly pear (nopales) and chili in our daily diet.

CONTENT DELIVERY

Start: This activity will work well if you make a poster or sign outside the door that reads: "Mexican Gastronomy Show" and have them prepare pins or something like that.

Development: Each team should present one of the following topics: fish, seafood, corn, prickly pear, chili, avocado, and coffee including nutritional information, production in Mexico, Mexican dishes that include the product and best season as well as a summary from pages 37 and 38. Besides, they should prepare a Mexican gastronomy show with a sample of a dish with the food they present. Each team should provide with feedback and a self-assessment score on their performance.

Closing: In the end of the class, let them grab a food sample.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts.

Vocabulary skills: Using didactic aids.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 10

Sessions: 58 - 60

Expected learning

outcome: Explain how it benefits health to include the great diversity of national foods with high nutritional value, especially fish, seafood, corn, prickly pear (nopales) and chili in our daily diet.

CONTENT DELIVERY

Start: This activity will work well if you make a poster or sign outside the door that reads: "Mexican Gastronomy Show" and have them prepare pins or something like that.

Development: Each team should give a presentation providing with feedback and a self-assessment score on their performance.

Closing: In the end of the class, let them grab a food sample.



FIG. 2.6 A great diversity of fish and shellfish with high nutritional value is consumed in Mexico.

From prehispanic days to the present, one of the main sources of protein in Mexico is found in water. It is common to grow trout in the highland rivers; some Mexican species are fished and raised in dams and lakes, such as white fish in Michoacan and species like tilapia or carp. Acamayas or crayfish, a delicious delicacy, are caught in fresh water in Michoacan and the Huasteca region, as well as other areas in the country. Fresh water aside, the ocean is really exceptional in diversity: tuna, sierra, lisa, red snapper (huauchinango), sea bass, and shark. These are just some of the species exploited in Mexico; we also get mollusks such as octopuses, squids, clams and oysters, and crustaceans such as shrimps, crabs and crayfish. Fish and shellfish are an important source of minerals like iodine, and also contain vitamin A (Fig. 2.6).

The only two species that pre-hispanic communities bred for human consumption were turkey and xoloitzcuintle (Fig. 2.7), the rest of the protein was obtained from hunting, fishing and by collecting some insects. Today, in many parts of the country we find dishes made with different kinds of species. There is food that comes from mammals (deer, armadillo, and gopher), reptiles (iguana and several species of turtles and snakes), amphibians (frogs), crustaceans (crayfish, also called acamaya or river shrimp) and mollusks (snails).



FIG. 2.7 The xoloitzcuintle, the only original Mexican dog breed, is characterized by its lack of hair.

Edible insects (grasshoppers, jumiles, maguey worms and escamoles) deserve special mention because they provide high quality protein.

Today, due to the worldwide exchange of products, food is becoming more and more similar and many native foods are being lost.

The proliferation of fast food around the world is part of a process of changes in diet patterns which have made obesity a serious public health problem.

➔ Reflect

Answer in your notebook:

- What are the consequences of losing a prehispanic cuisine like ours?
- Do you think that by no longer having these kinds of dishes due to fast food, there is a loss of identity?

38

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts.

Vocabulary skills: Using didactic aids.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Acknowledging the Importance of a Good Diet and Consumption of Water to Keep Healthy

What should we eat to have good nutrition? Nutrition is understood as the process by which your body gets its nutrients; on the other hand, eating is the way you consume food to get them.

Nutrients.

The nutrients that our body requires can be divided into four basic groups; good nutrition requires all of them.

Carbohydrates are nutrients which mainly provide energy for the proper performance of your body; they are also known as sugars, which give food a sweet taste.

Lipids are substances that our body uses to store energy for future needs. These can be liquids or solids, the first are known as oils obtained mainly from vegetables; the second are called fats, the most common example is lard (Fig. 2.8). Oils typically contain **monounsaturated and polyunsaturated lipids**.

In addition to storing energy, lipids fulfill other important functions in your body. For example they form some **hormones**, such as the sexual ones. They also accumulate under your skin to prevent heat loss and to help protect organs such as the kidneys or the ovaries.

Proteins represent one of the main structural and functional components of your body; in fact, they constitute more than half of the dry weight (without water) of all animals.

Vitamins are essential to help proteins in many of the chemical reactions that occur in your body. They can be divided between those dissolved in water (water-soluble) and those dissolved in oils or fats (fat soluble). Your body also needs **minerals**, without them some proteins may not work.

→ Expected Learning

Explain why maintaining a proper diet and drinking water can prevent some diseases and disorders such as anemia, obesity, diabetes, anorexia and bulimia.

FIG. 2.8 Fats are necessary for the proper performance of the body; however, it is necessary to consume them with great restraint.



→ Research

The importance of small quantities

As you can see, although some vitamins and minerals are required in small quantities, major health problems are generated when they are not consumed.

Get more information by answering the following questions:

- Which are the most common diseases that occur due to vitamin and mineral deficiency?
- At what ages are they more frequently presented?
- Where can these vitamins and minerals be found?

GLOSSARY

Lipids. Organic substances mostly composed of carbon and hydrogen.

Monounsaturated and polyunsaturated lipids. Have one or more double bonds in their structure respectively.

Hormone. Substances that are secreted by different glands to the bloodstream and regulate the action of specific organs or systems.

39

SESSION INFORMATION

Week: 11

Sessions: 61, 62

Expected learning

outcome: Explain why maintaining a proper diet and drinking water can prevent some diseases and disorders such as anemia, obesity, diabetes, anorexia and bulimia.

CONTENT DELIVERY

Start: Have students answer the following question according to the text in pairs:

What's the definition of nutrient, carbohydrates, lipids, proteins, and vitamins?

Elicit for their answers.

They should write them down on the board, with their own words.

Development: Ask students to find examples from each group and write them down on the board. Then, they should design a daily menu (breakfast, lunch, dinner), which includes the four types of nutrients.

Closing: Students should be divided in teams to present "The Eatwell Plate" and "The Good Drinking Jar". Both topics might be segmented. They should provide with visuals.

SKILLS DEVELOPMENT

Critical thinking skills: Applying information.

EVALUATION OF CONTENT

Check everyone (or the most students) can tell a menu with all the nutrients.

SESSION INFORMATION

Week: 11

Sessions: 63, 64

Expected learning

outcome: Explain why maintaining a proper diet and drinking water can prevent some diseases and disorders such as anemia, obesity, diabetes, anorexia and bulimia.

CONTENT DELIVERY

Start: Ask students for examples of the nutrients and write them on the board.

Development:

Students should give the presentations on “The Eatwell Plate” and “The Good Drinking Jar”. Prepare a poster to illustrate both in case the teams fail to make appropriate material. Help accordingly.

Closing: They should improve the menus they previously created. This time, they should include the best portions of each nutrient. Besides, they should answer the questions in the hands on activity page 41.

Project preparation: In sessions 65 and 66 They will be presenting eating disorders. Make sure all of them participate.

The presentation should include: the eating disorder (explained on page 41) and any further information they can get as well as visuals, and a chant/rap in which they depict the eating disorder and possible solutions to it.

Food groups

Based on the major nutrients, foods are classified in three groups. These groups can be combined to meet your nutritional needs, following the recommendations of “The ‘eatwell’ plate” (Fig. 2.9):

FIG. 2.9 “The ‘eatwell’ plate”.
Source: NOM-043-SSA2-2005.



1. Cereals and tubers: are composed mainly of carbohydrates, thus they are the main source for obtaining energy.
2. Fruits and vegetables: primarily provide vitamins and minerals, which are essential for the metabolism. The main vitamins are carotenes, vitamin C and folic acid, while the most abundant minerals are iron and zinc.
3. Legumes and food of animal origin: constitute the main component for humans.

Now that you are familiar with the different food groups (Fig. 2.10), let's see how they can be merged into a proper diet, including the following six characteristics:

- Enough: It must meet all the nutrient needs.
- Well-rounded: Contains all of the nutrients (proteins, carbohydrates, lipids, vitamins and minerals).
- Varied: Includes foods from different groups in each meal.
- Balanced: The food you eat should provide nutrients in a proper proportion.
- Safe: Should not cause health problems, must be hygienic and consumed with moderation.
- Appropriate: It must be consistent with the tastes and culture of those who consume it, according to their economic resources (without giving up other features).

FIG. 2.10 Food groups.



Water

Water constitutes approximately 70% of our body weight. It is also one of the main components in food, which means you get it in every meal. However, you lose water through respiration, perspiration and urine depending on the weather and your physical activities, so it is very important to drink it to stay balanced.

The Ministry of Health recommends drinking from 6 to 8 glasses of water every day. “The Good Drinking Jar” can help you make a plan (Fig. 2.11).

Drinking water, as opposed to other liquids, helps us transport nutrients through the body to produce the energy that allows us to keep active. It also removes waste from kidneys and improves their performance, moisturizes the skin, controls body temperature, facilitates the process of digestion, normalizes blood pressure and eliminates waste from our body, among other things. That's why your school encourages you to drink water.



FIG. 2.11 “Good Drinking Jar” is a diagram similar to “The ‘eatwell’ plate”, which will help you make decisions regarding your fluid intake.

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SKILLS DEVELOPMENT

Critical thinking skills: Modeling, reformulating.

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

→ HANDS ON

Do you drink enough water?

1. Write down in your notebook how much water and other beverages you drink and at what time of the day.
2. Analyze your results:
 - How similar is your consumption of beverages to that recommended in the good drinking jar?
 - Is your consumption of water enough to keep you healthy according to this plan?
 - Can you improve your water consumption? How?

Prevention of nutrition-related diseases.

Some of the main health problems are related to nutrition, in particular with the inadequate consumption of different food groups. People who do not consume enough nutrients develop some kind of **malnutrition**.

Protein and energy malnutrition causes the body to lose the ability to recover, increases the risk of catching other illnesses and, in extreme cases, may cause death.

Obesity or being overweight basically occurs because people consume more energy than what they spend; it accumulates in the body as fat, increasing the possibility of heart diseases, blood pressure and diabetes, among other disorders.

Diabetes is a condition characterized by an increase of glucose in the blood, caused mainly by the absence of a hormone called insulin, which is responsible for regulating the amount of glucose in the blood and can make it difficult to absorb nutrients.

Anorexia and **bulimia** are diseases in which people are afraid of gaining weight which is directly related to social acceptance. People suffering from bulimia experience episodes of consuming large amounts of food, followed by a great feeling of guilt, which leads to practices to avoid gaining weight, such as, vomiting, using laxatives or fasting, which are hazardous to health. Anorexia is triggered when people believe they are overweight, even though they are actually thinner than normal (Fig. 2.12). Here begins a radical decrease in food intake; if the condition continues, it may cause death.



FIG. 2.12 Diseases such as bulimia and anorexia are eating disorders usually caused by fashion and beauty stereotypes.

Kells

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SESSION INFORMATION

Week: 11

Sessions: 65, 66

Expected learning

outcome: Explain why maintaining a proper diet and drinking water can prevent some diseases and disorders such as anemia, obesity, diabetes, anorexia and bulimia.

CONTENT DELIVERY

Start: Explain what an eating disorder is.

Development: Students should give their presentation on eating disorders. Make sure all of them participate. The presentation should include: the eating disorder (explained on page 41) and any further information they can get as well as visuals, and a chant/rap in which they depict the eating disorder and possible solutions to it. . Help accordingly. Make sure you raise awareness on the problem and that they can prevent them.

Closing: Students should self-evaluate their presentations and tell what they will do to improve it next time.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Vocabulary skills: Cueing.

Critical thinking skills: Defining concepts.

Interpersonal skills: Caring for others.

Musical skills: Singing.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 12

Sessions: 67- 69

Expected learning

outcome: Question statements which are based on false reasons or with little or no scientific support when identifying health risks due to the use of weigh loss products and diets.

CONTENT DELIVERY

Start: Try to get some magazine adds or a commercial that depicts the problem of losing weight. Ask them if they think the product or service is effective and why.

Development: Have students do the hands on activity in teams. Elicit their answers. In whole class, check the group's answers. Have them name at least four ways they know to lose weight. Ask them how effective they think each way is. Have them write the information they give on the board.

Closing and project preparation: Tell them they will be analyzing media information on weight loss. Set them in teams They should present the information on pages 42 and 43The project should include: Information from the book, additional information that includes advantages and disadvantages, bibliography, and visuals of such method.

→ Expected Learning

To question statements which are based on false arguments or with little or no scientific support when identifying health risks due to the use of weight loss products and diets.

Analyzing Media Information on Weight Loss

→ HANDS ON

Ask your acquaintances if they have taken products for losing weight

- Do you know someone on a diet? Ask him/her about the results. Was it supervised by a nutritionist?
- What have been the results in either of the cases and why? Is he/she satisfied with the effects?
- Discuss and compare with your team the results of your field research, then write a report with all your comments.
- Discuss it and write a conclusion.

When we consume greater quantities of energy than what we use, our body starts to store it as body fat and what begins as being overweight might end in obesity. It may take time to realize this is happening, since it is a slow process and your body gets used to it. But, as time goes by, it turns out to be a health problem which sometimes makes us look for quick solutions for weight loss.

There are many products for weight loss (sometimes they are very expensive) so it is complicated to choose the right one. To find their benefits is as difficult as to determine their side effects, due to each consumer's condition (Fig. 2.13).

However, there are many known cases where the use of these products is associated with dehydration, sudden fainting, digestive problems, (diarrhea, constipation, nausea), dizziness, cardiac and circulatory problems (such as hypertension), liver and kidney problems due to intoxication and sudden changes in behavior (insomnia, moodiness and nervousness and in some cases depression). Colon cancer and even death are also associated to the misuse of these products.

FIG. 2.13 There is a wide variety of slimming products on the market. Not all are safe and effective.



Weight loss products are advertised on: television, radio, magazines and billboards, and present models with features that hardly correspond to the average population. These messages respond mainly to economic interests and some industries take advantage of the weight problem by promoting the image of healthy bodies and generating stereotypes for young people to imitate, modifying the concept of beauty and affecting people's lives.

Kells

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SKILLS DEVELOPMENT

Critical thinking skills: Brainstorming.

Interpersonal skills: Working as a team.

EVALUATION OF CONTENT

Students should be integrated in a team and should help with the brainstorming.

SESSION INFORMATION

Week: 12

Sessions: 70 - 72

Expected learning outcome: Question statements which are based on false reasons or with little or no scientific support when identifying health risks due to the use of weight loss products and diets.

It is advisable to recognize a weight problem and take steps to correct it. But before taking any action, it is important to understand that you must do it safely through healthy food and exercise. You can start following the directions of the "eatwell plate", trying to reduce your intake of carbohydrates, but not completely eliminating them from your diet.

Consider that exercise and physical activities are healthy as well as fun: ride your bicycle or roller skate, practice a sport, walk with long, fast steps when you have to go somewhere. There are many ways to be more active and doing it with your family can make it more fun. (Fig. 2.14).



SO FAR YOU HAVE LEARNED THAT...

- Nutrients are absorbed through the digestion of food and they are essential for having a healthy body.
- You can develop skills to evaluate your diet and make better decisions on how to eat by choosing foods based on their nutritional characteristics.
- Our country's food and cultural diversity can be very useful to enriching your diet.
- You can prevent diseases related to nutrition and maintain a critical and informed position against advertisements for weight loss products.

FIG. 2.14 Exercise and a healthy diet help maintain a good weight.

CONTENT DELIVERY

Start: Ask students to make a chart to summarize information in their notebooks.

Development: As they give their presentations, they should fill out the chart with information they provide with, help accordingly. By the end of each presentation, each team should self-evaluate and self-correct their presentation.

Closing: Students should hand-in their charts filled out.

43

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information, monitoring, self-correcting.

Critical thinking skills: Defining concepts, summarizing information.

Interpersonal skills: Working as a team.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132. Check the chart.

SESSION INFORMATION

Week: 13

Session: 73

Expected learning

outcome: Discuss the importance of interaction between living things and their relationship with the environment in the development of diverse adaptations associated to nutrition.

CONTENT DELIVERY

Start: Show students the picture 2.15 on page 44 and ask them what they see and if they are similar. Elicit for their answers.

Development: Students should read page 44 and 46 and create a quiz about it. Then, they should exchange notebooks to get their questions answered based on the information they read on page 44.

Closing: Ask them comprehension check questions.

Homework: Students should read the lab practice on page 45 and do it. The following session, they will present their lab findings.

Expected Learning

Discuss the importance of interaction between living things and their relationship with the environment in the development of diverse adaptations associated to nutrition.

A Comparative Analysis of some Nutrition-Related Adaptations

Nutrition is a vital need, and to satisfy it, organisms have found different solutions thanks to evolution. In fact, all species have adaptations that have to do with acquiring or producing their food and, with the exception of large predators, all organisms also have adaptations that help them from becoming food for someone else.

More primitive animals, such as sponges, do not have a digestive system, although they have specialized cells that obtain nutrients. Other living things such as corals, anemones, hydras and jellyfish, possess a central cavity specialized in digesting, with a single hole for food to enter and exit. Almost all other animal species possess digestive tracts beginning at the mouth, followed by, at least one stomach, intestine and an exit through the anus.

Digestive systems have the same functions in all adaptations, but not all the systems are the same. For example, birds have no teeth and use gizzards to grind food before regurgitating and eating it again. For many herbivorous mammals, such as deer or sheep, digesting green plants is a difficult task because it takes a long time, so they also regurgitate the leaves and stems again. (Fig. 2.15).

GLOSSARY

Regurgitate. Expel through the mouth, effortlessly, substances that were harbored in the stomach. Aside from digesting food, many birds use regurgitation to feed their young.

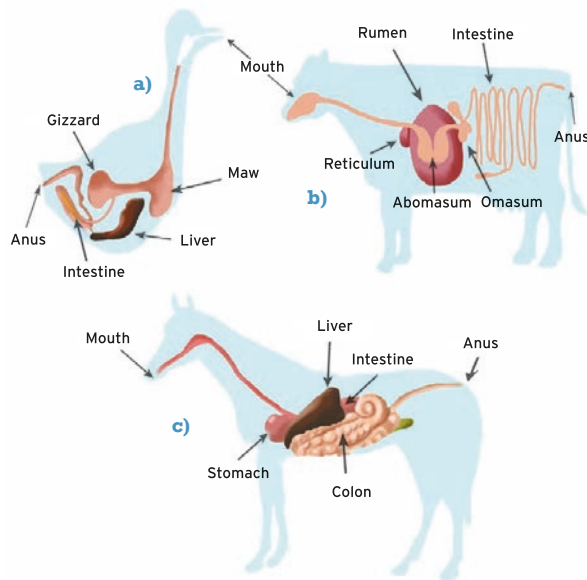


FIG. 2.15 The digestive systems of animals are adapted to their particular form of diet. a) Bird, b) Cow and c) Horse.

44

SKILLS DEVELOPMENT

Critical thinking skills: Formulating questions.

Naturalistic skills: Comparing and contrasting.

EVALUATION OF CONTENT

It will be done through the comprehension check questions.

In the Lab

Insects' mouths and tongues.

The mouths of all species are adapted to a particular kind of food. This adaptation is more or less evident in different species, for example, the long snout and tongue of the anteater, or the sharks' multiple rows of teeth. Together with your classmates, research the odd mouths of insects.

Material

- A net to hunt flying insects (Fig. 2.16). You can make it with a large embroidery ring and tulle. It has to be deep (between 70 and 90 cm).
- A net for hunting insects in the grass. Here you need a smaller and more resistant net. You will need a thick (about 10 cm in diameter) medium-size embroidery hoop and cotton cloth to form a bag of about 25 cm deep.
- A large lidded jar.
- Alcohol.
- A magnifying glass or a stereoscopic microscope (in the laboratory).

Procedure

1. Fill the jar halfway with alcohol.
2. In teams, trap at least five different types of insects, using both nets.
3. As soon as an insect is captured, place it in the bottle with alcohol. Before catching the insects ask your teacher if there is a better way of preserving them. If so, follow the teacher's suggestion.
4. In the laboratory, study each insect with a magnifying glass or a stereoscopic microscope. Make a drawing of each one and discuss what type of food the insects can eat with their mouths.
5. Write down your conclusions in your notebook.

If you don't like insects, you can observe animals in the field, in a park or visiting a zoo. If you choose this option, don't forget to follow these steps:

- Make a drawing of the mouth each species has.
- Discuss the kind of food they are adapted for.
- Record your findings in your notebook.

A case of adaptations race: predator-prey interaction.

The term **predation** applies to any interaction in which an organism feeds on another to survive; the first is called **predator** and **prey** the second. To survive, both predator and prey depend on their ability to counteract the skills of the other.

An organism that is at risk of being devoured by another can defend itself actively or passively. Active defenses are reduced to escaping or fighting back; passive defenses are



FIG. 2.16 A net to hunt insects in the grass.

SESSION INFORMATION

Week: 13

Session: 74

Expected learning

outcome: Discuss the importance of interaction between living things and their relationship with the environment in the development of diverse adaptations associated to nutrition.

CONTENT DELIVERY

Start: Check that students can see the difference between the three animals mentioned in the picture 2.15 on page 44.

Development: Students should present their findings in the lab. (Another option is to have the lab activity done in class).

Closing: Ask students to write a report on their lab practice that includes: Hypothesis, Practice description, and conclusion.

SKILLS DEVELOPMENT

Logical/Mathematical skills:

Experimenting, deducing.

Verbal-linguistic skills: Writing a lab report: Stating a hypothesis, describing, concluding.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 13

Session: 75

Expected learning

outcome: Discuss the importance of interaction between living things and their relationship with the environment in the development of diverse adaptations associated to nutrition.

CONTENT DELIVERY

Start: Check that students can see the difference between the three animals mentioned in the picture 2.15 on page 44.

Development: They should present their findings in the lab. (Another option is to have the lab activity done in class).

Closing: Ask students to write a report on their lab practice that includes: Hypothesis, Practice description, and conclusion.

Project preparation:

Students should work in teams. They should give a presentation on trophic levels for the following sessions. They will read pages 47 and 48 and include: The trophic level name, definition, examples and living samples. Have students make a real ecosystem with a pet bottle, soil and insects. Explain the project evaluation, projects rubrics page 132.

GLOSSARY

Mimesis. Ability that some living things have to imitate the shapes and colors of their environment and be able to go unnoticed; this phenomenon occurs in both, prey and predator.

Sessile. Organisms that live attached to a substrate.

Coevolution. When two or more species reciprocally affect each other's evolution.

much more diverse than the active ones. One of the most widespread in nature consists of blending in with the environment known as **mimesis**.

Plants also defend themselves. As they are **sessile** organisms, plants have developed a powerful range of passive defenses, both physical and chemical. The most obvious physical defense are thorns. Chemical defenses of plants include the production of poisons or substances with an unpleasant taste, so as not to be digested.

Predators use two basic strategies: one is stalking and attacking the prey; another is making traps (Fig. 2.17). In the first case, predators need to approach their prey to get as close as possible without being perceived, and then attack it as rapidly as possible. As for traps, perhaps no organism has achieved the degree of refinement as spiders, with their very specialized styles of webs.

The fastest mammals, both herbivores and carnivores, have a very similar adaptation for running: they only touch the ground with the tips of their toes. The resemblance is not in any way a coincidence, but is, instead, evidence of how the predator-prey interaction imposes a joint evolution in two participating species; in other words, **coevolution** between species.

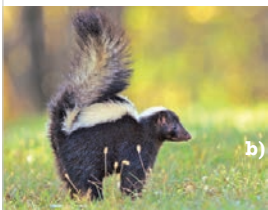


FIG. 2.17 Prey active defense: a) Horns, claws or spines can be used as weapons against predators, as the rhinoceros's horns, b) Skunks spray their attackers with an extremely odorous substance that normally makes attackers run away.

In your community

Predator or prey?

Relationships between predators and prey occur any place in which there are living things. Try to identify some in your area.

Material

- A notebook to write down your observations.
- Cardboard.
- Colors.
- Bibliography of animals that you choose.

Procedure

1. Work in teams, choose a natural green area or park in your town; if your community is urban, locate the nearest park to make your observations. Select at least three animals that attract your attention, make sure that they are as different as possible (birds, insects, mice, etc.). Observe their conduct, avoid interfering with their natural behavior; you may have to visit the site on several occasions and at different times of day. Write down your observations and comments.
2. Answer the following questions:
 - Did the organisms you observe have predator or prey behavior? or both?
 - What behavior did you notice?
 - According to your research, what would their prey or most common predators be?
 - Which behavior observed can be related to the research data?
 - Make illustrations and diagrams that explain the results of your investigation.
 - Present them to your classmates.

Kells

46

SKILLS DEVELOPMENT

Logical/Mathematical skills:

Experimenting, deducing.

Verbal-linguistic skills:

Writing a lab report: Stating a hypothesis, describing, concluding.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

The Importance of Autotrophic and Heterotrophic Organisms in Ecosystems and Photosynthesis, as the Basis of Food Chains

In evolution, living things develop diverse strategies to obtain nutrients they need to survive and evolve. Generally speaking, those strategies divide organisms into those that are able to produce their own nutrients (**autotrophs**), and the ones which must obtain them from the environment where they live (**heterotrophs**).

The first living things appeared approximately 3,500 million years ago in a nutrient rich ocean. As time passed by, nutrients from that primitive ocean started to become scarce and in some individuals from the Monera group, the ability to use solar energy to produce their own food was developed (Fig. 2.18) in a phenomenon known as photosynthesis. Photosynthesis is the transformation of water and carbon dioxide into glucose and oxygen, which are released into the environment. In most plants, photosynthesis occurs in green leaves, their green color comes from a substance named chlorophyll, which has an amazing ability in capturing light as a fundamental energy source.

1,000 or 2,500 million years ago, protozoa appeared; a kingdom that includes autotrophic and heterotrophic uni-celled beings. The other three kingdoms emerged approximately 550 million years ago, comprised of pluri-celled organisms. They are characterized by the way they obtain nutrients. Plants are photosynthetic autotrophs, fungus is heterotrophic and feeds on dead organic matter, and animals are heterotrophs and perform digestion in specialized, internal organs.

→ Expected Learning

Explain the participation of autotrophic and heterotrophic organisms as part of food chains in the dynamics of an ecosystem.

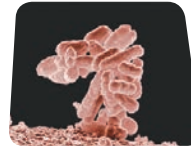


FIG. 2.18 Digestion performed by heterotrophic bacteria is accomplished by means of digestive enzymes secreted on food. Nutrients enter bacteria through the membrane.

→ HANDS ON

Trophic levels



- Kingdoms, in which living things are classified, differ from one another, among other things, by how they acquire nutrition, and therefore occupy very specific positions in food chains. Analyze the food chains in Unit 1 (pag.13); then complete the following graph:

Trophic level	Represented Kingdoms	Examples
Producers	plants	_____
Consumers	_____	deer, fox
Disintegrators	fungus	_____

Kells

47

SESSION INFORMATION

Week: 13

Sessions: 76 - 78

Expected learning outcome: Explain the participation of autotrophic and heterotrophic organisms as part of food chains in the dynamics of an ecosystem.

CONTENT DELIVERY

Start: Students should copy the chart on page 47, in the hands on activity in their notebooks. As each team presents, the rest should complete it with the samples that are shown in class.

Development: Students should work in teams. They should give a presentation on trophic levels for the following sessions. They will read pages 47 and 48 and include: The trophic level name, definition, examples and living samples. Explain the project evaluation, which will include the parameters described in the projects rubrics page 132. Students should give their presentations. Later, they should self-evaluate.

Closing: Check that students have a complete chart by the end of the presentations.

SKILLS DEVELOPMENT

Critical thinking skills: Defining concepts, summarizing.

Metacognitive skills: Planning, organizing, delivering content, self-evaluating, self-correcting.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132 and the complete chart.

SESSION INFORMATION

Week: 14

Sessions: 79 - 81

Expected learning

outcome: Explain the participation of autotrophic and heterotrophic organisms as part of food chains in the dynamics of an ecosystem.

CONTENT DELIVERY

Start: Students should copy the chart on page 47, in the hands on activity in their notebooks. As each team presents, the rest should complete it with the samples that are shown in class.

Development: Students should work in teams. They should give a presentation on trophic levels for the following sessions. They will read pages 47 and 48 and include: The trophic level name, definition, examples and living samples. Explain the project evaluation, which will include the parameters described in the projects rubrics page 132. Students should give their presentations. Later, they should self-evaluate.

Closing: Check that students have a complete chart by the end of the presentations.

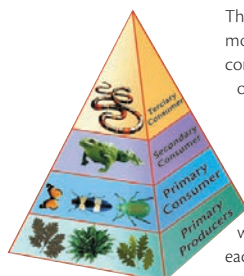


FIG. 2.19 Trophic pyramid showing how as long as a superior level is occupied, the number of individuals decreases considerably.

SO FAR YOU HAVE LEARNED THAT...

- Anatomic differences in digestive systems of organisms are the result of evolution.
- The way autotrophic and heterotrophic organisms participate in food chains and provide structure to the dynamics in an ecosystem.
- The general process of photosynthesis and its importance as the energy producer available in a food web.

As shown in the activity, there are three main trophic levels: producers, consumers and degraders, among which matter and energy flow within an ecosystem.

The scheme of a food web is specially useful to represent the flow of matter, because it moves cyclically in nature, adopting different forms, but keeping its quantity as constant. However, the same does not happen to energy and therefore the scheme of the trophic pyramid (Fig. 2.19) is more appropriate to represent its flow.

The pyramid divides trophic links into producers and different levels of consumers: primary consumers, which feed themselves from producers. Secondary consumers which feed themselves from primary consumers, tertiary consumers which feed from secondary consumers, and so on, until the top is reached. The width of each level represents the amount of organisms it contains, and decreases in each link.

The above happens because the transfer of energy in the trophic level is not complete. A large portion of it is used by organisms in each link to stay alive, and another portion is released as heat, in such a way that it is no longer available for the next trophic level.

Reading

Social and environmental problems and their relationship with Science

Photosynthesis lessons

What we learn from nature's energy processes has helped create technologies which aim to solve the energy supply problem for human beings. Renewable energy sources, such as oil and gas are being exhausted, in addition to the fact that their extraction and use damage ecosystems and their inhabitants. Renewable fuels, such as firewood also exist, but sometimes they are overused and cannot regenerate; as a consequence, deforestation and soil erosion may take place.

Due to this, it is necessary to develop alternative technologies to obtain energy from new sources which are friendly to the environment. One such technology is solar cells which use two fundamental principles of photosynthesis:

1. The use of a tint to absorb light and produce an electric flow. In the case of photosynthesis, the organic tint is chlorophyll.
2. The use of multi layers, to make the absorption of light and flow of electricity more efficient. This is a structure similar to the way chlorophyll is organized in plant cells, because it is also found in multiple membranes that increase surface absorption and the speed at which electric charges are transported.

Kells

48

SKILLS DEVELOPMENT

Critical thinking skills: Defining concepts, summarizing.

Metacognitive skills: Planning, organizing, delivering content, self-evaluating, self-correcting.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132 and that the chart is complete.

Equity in the Present and Future Use of Food Resources: Towards Sustainable Development

➔ Reflect

Answer in your notebook:

- In unit 1, you reviewed some challenges that the conservation of biodiversity faces in the present. Do you consider that human beings' nutrition has something to do with this theme? Why?
- How is food preserved in your house? Do you know other ways to preserve it?

Share your answers in teams, trying to use everyday experiences. Then, answer these questions again, and present your conclusions to the group.

➔ Expected Learning

Explain how sustainable consumption, science, and technology can contribute to equity in the use of food resources for present and future generations.

Currently, global agricultural production is enough to feed the population, in fact, some of this food is wasted because there is no place for it in the market. This contrasts with the lack of food in some rural communities and the neediest population in cities. Furthermore, technological advances have exhausted the land, and generated other environmental problems that jeopardize the ability to produce enough food for everybody in the future.

The effects on the environment caused by the overexploitation of natural resources to satisfy society's needs has required the intervention of international organizations. In 1987, the document "Our Common Future", also known as the Brundtland Report, was presented before the United Nations (UN). The document was based on a diagnosis that, among its most relevant points, emphasized the following:

- The prevailing development model had privileged the economic growth without thinking about the environmental damage and the social inequality it caused.
- The existence of the close relationship between poverty and environmental problems that are expressed in two ways: on the one hand, the effects of environmental damage are not usually suffered by the ones who caused them, but by the poorest people, on the other hand, the lack of resources, force people to use practices that harm the environment.
- At the end of the XX century, human action reached the ability to alter the environmental dynamics of the planet, jeopardizing the possibility for future generations to satisfy their needs.

SESSION INFORMATION

Week: 14

Session: 82

This page and the following one are given in the same session.

Expected learning outcome: Explain how sustainable consumption, science, and technology can contribute to equity in the use of food resources for present and future generations.

CONTENT DELIVERY

Start: Students should reflect upon the questions on page 49. Elicit for their answers.

Development: Students will read pages 49 and 50 in pairs. Then, they should make up a Mind map with the concepts they read. Explain how a mind map should look.

Closing: Students should hand-in their mind maps.

SKILLS DEVELOPMENT

Critical thinking skills: Ordering data, mind mapping.

Reading skills: Word associating.

EVALUATION OF CONTENT

Students should hand-in their mind maps.

SESSION INFORMATION

Week: 14

Session: 82

This page and the previous one are given in the same session.

Expected learning outcome:

Explain how sustainable consumption, science, and technology can contribute to equity in the use of food resources for present and future generations.

CONTENT DELIVERY

Start: Students should reflect upon the questions on page 49. Elicit for their answers.

Development: Students will read pages 49 and 50 in pairs. Then, they should make up a Mind map with the concepts they read. Explain how a mind map should look

Closing: Students should hand-in their mind maps.

Homework: Students should take two types of corn. One with small teeth and another with large ones.

GLOSSARY

Temporary agriculture. depends exclusively on rainwater.

Landraces. In agriculture, those varieties of cultivated species that are original to a certain region or country.

According to the Brundtland report, **sustainable development** is defined as “that which satisfies the present needs without compromising the possibility of future generations to meet their own needs”. The concept is now presented in three dimensions:

- **Economic dimension.** Economic growth continues to be an objective, but not as a goal in itself. It is a way to improve the living conditions of the population, and a necessary element to bring down poverty.
- **Social dimension.** States that all human beings should have the same opportunities to fully develop and achieve their welfare.
- **Environmental dimension.** States that productive activities should not exploit natural resources faster than they can be replaced, also they should generate less pollution; consumption should be modified to lower the amount of waste discharged into the air, soil, and water; and finally, all ecosystems and their biodiversity should be protected so future generations can enjoy a healthy environment and the services it provides.



FIG. 2.20 Tractors helped tilling and seeding to be done with less human effort.

Technology in agriculture.

The main technological developments used in worldwide agriculture are:

- **Irrigation**, which made it possible to sow in places where rain was scarce, increasing productivity in land that only used **temporary agriculture**.
- **The tractor**, allowed tillage and seeding work that used to take days, to be completed in hours (Fig. 2.20).
- **Improved seeds**, allow crops to be three to four times more abundant than **landraces**. These seeds are especially those of cereals grown in the world: wheat, corn and rice.
- **Fertilizers**, added nutrients to soil so plants could grow vigorously.
- **Pesticides**, that help keep plants from plague.

In our country the “green revolution” from the 1950’s brought environmental consequences that had not been foreseen, as well as in the entire world. For example, soils were planted progressively with only products that were sold the most, a practice known as **monocrop**. In many places crop rotation, which allowed the soil to get its nutrients back, was lost.



FIG. 2.21 Application of pesticides using planes can pollute neighboring fields if appropriate protective environmental measures are not taken.

Also the introduction of irrigation and tractors accelerated degradation of the land, so fertilizers that were used moderately, became mandatory little by little. Irrigation is starting to be a problem, because in many places its excessive use has turned into depletion of water resources.

On the other hand, the first pesticides used turned out to be extremely toxic for human beings and the environment. As a result, laws were created. These laws state that for a pesticide to be approved, it has to prove that it does not harm human beings’ health and the environmental effects must be “reduced” (Fig. 2.21).

50

SKILLS DEVELOPMENT

Critical thinking skills: Ordering data, mind mapping.

Reading skills: Word associating.

EVALUATION OF CONTENT

Students should hand-in their mind maps.

SESSION INFORMATION

Week: 14

Session: 83

Expected learning outcome: Explain how sustainable consumption, science, and technology can contribute to equity in the use of food resources for present and future generations.

CONTENT DELIVERY

Start: Show students two corn samples. One with large teeth and the other with small teeth. Ask them which crop they think used pesticides and fertilizers. Elicit for their answers.

Development: Have them read page 51 and discuss what would be better, to have more money or better crops? They will discuss in groups of 7 people: Assign different roles to discuss it: The governor, the farmer, the retail storeowner, the consumer, the truck driver, the chemistry engineer, the president. They should reach a consensus.

Closing: The consensus they reach should have three reasons why they decided it.

Homework: Students should take to school some fresh pineapple and some canned pineapple.

Fertilizers and pesticides in Mexico

Reading

In Mexico agrochemicals are widely used in the most productive agricultural zones where they have caused important environmental problems. For example, the fertilizer virtually used in most crops is *urea*, a substance that provides nitrogen for plant development (Fig. 2.22).

The problem with nitrogen components is that if they reach bodies of water, they create very nutritious broths, ideal for bacteria and other microorganisms that start to consume dissolved oxygen very fast; this causes fish stocks and crustaceans to decrease, or in extreme cases to disappear. This process called eutrophication is not only a responsibility of agriculture. In cities, this process can take place when untreated sewage is deposited in rivers. Both, cities and agriculture have caused this problem at different levels in rivers, and practically, all the lakes in the country.

To authorize a pesticide in Mexico, it must be proven that it generates no toxicity for human beings in treated fields, and that the time it takes to disappear from the environment is short, among other requirements. However, some can be toxic when applying them, and above all, have a degree of toxicity for all species. When used without the proper care, pesticides are an important source of pollution.

In our country, the most commonly used pesticides are herbicides (which attack the undergrowth) in grains, as well as insecticides and fungicides (which attack insects and fungus respectively) in the cultivation of vegetables. Insecticides merit particular attention because their environmental effects are usually higher due to two reasons: 1) While attacking insects they also affect bee populations which are essential to the pollination of many wild plants. 2) In grains, an application or two of herbicide is enough, vegetables such as tomatoes, require dozens of applications of insecticide.

With all these problems, it would seem reasonable not to use agrochemicals at all, and cultivate crops using only traditional practices. However, this is not possible for the vast majority of small farmers because they are usually paid very low prices in the market for their products, and traditional techniques produce smaller crops.

Nadal, Alejandro (2000), *the Environmental and Social Impacts of Economic Liberalization on Corn Production in Mexico*, WWF/Oxfam



FIG. 2.22 Application of fertilizers like the urea, as well as most pesticides, is done manually.

Reflect

Answer in your notebook:

- What would happen if food prices were increased so they could be sustainably produced?
- What role do science and technology play in solving this problem?

Kells

51

SKILLS DEVELOPMENT

Interpersonal skills: Mediating, working as a team member.

Verbal-linguistic skills: Discussing.

EVALUATION OF CONTENT

Students should be able to defend their point of view according to the role they are assigned.

SESSION INFORMATION

Week: 14

Session: 84

Expected learning

outcome: Explain how sustainable consumption, science, and technology can contribute to equity in the use of food resources for present and future generations.

CONTENT DELIVERY

Start: Ask students to analyze the two samples of pineapple (canned and fresh). They should answer: Which one is tastier? Which one is better?

Elicit answers

Development: Students should read the text on preservation of food (in the middle of the page). Then, they should list things they usually use and what is the best thing to do with them: recycling them, reusing them or decomposing them? If none of these options looks feasible, then they should find substitutes for the products they normally use.

Closing: Students should do the campaign described in the hands on activity.



FIG. 2.23 Canning is the most widespread modern technique for preservation.

Many ethnic groups still practice crop rotation in our country. They let the soil rest, so it can get its nutrients back. They use organic fertilizers, and plant different kinds of landrace corn, and many native species.

It is estimated that 45% of the annual deforestation of jungles and forests in our country is due to the clearing of land for livestock and only 13% of land for agriculture (the remaining 38% is the result of fire and in smaller proportion logging and urban growth, among other factors). Causes for the loss of forests are, for example, the erosion of soil that reduces absorption of water, which in turn reduces groundwater reserves and increases the possibility of flooding. Additionally, livestock passing through compacts the soil which decreases productivity in the long run.

An alternative is maintaining livestock in reduced spaces where they are fed with sorghum, alfalfa, corn and other grains. Also, intermediate technology has been proposed such as pasture rotation, this is, let the animals graze in a delimited portion of land some time, then move them to another portion of land, this way the first portion of land will rest and regenerate its pastures to be used again.

Preservation of food.

It is important to realize that consumption and production of food are not the same. Although this problem has fundamental economic explanations, to solve it we need more responsible practices in consumption, and to apply some conservation techniques.

Moderate conservation techniques operate with more varied principles that go from freezing food to avoid any biological activity that could decompose it, prevent the arrival of microorganisms, or to eliminate them by using chemicals (Fig. 2.23). Among modern techniques, pasteurization deserves special attention; it consists of heating food from 60° to 80°C to eliminate most microorganisms present and retard decomposition.

One of the greatest problems for a consumer society is waste production. To face the problem in areas of sustainability, different technologies have been developed that demand less raw materials from nature, therefore less waste production. Two of the most common are **recycling**, whereby part of the waste is processed to produce new materials, and the **reusing** of materials (Fig. 2.24). these two alternatives can be used to reduce waste by choosing recyclable and returnable packages (like glass containers, for example, in the case of soda).

FIG. 2.24 Waste generation is one of the worst environmental problems.



HANDS ON

Recycle to Conserve

- Organize a waste separation campaign for your school.
- Make up research teams and develop a bulletin board about the different related themes (kinds of waste, utility in industry).
- Check that waste separation is done, ask for your teachers' support.

Kells

52

SKILLS DEVELOPMENT

Critical thinking skills: Problem solving.

EVALUATION OF CONTENT

Students should make a campaign poster in which they explain the reasons why it is important to separate waste.

Assessing the United Nations Environment Program Towards Sustainable Development

Environmental problems generated in one place may have consequences in other places. Environmental problems and their magnitude motivated the United Nations in 1972 to create the United Nations Environment Program (UNEP). There are also many other international organisms that bring together governments from certain regions of the planet, as well as multiple initiatives, social organizations, investigators, and people that are concerned about the environment.

UNEP, Inter-American Institute for Cooperation on Agriculture (IICA), and many other institutes of international cooperation, start from the diagnosis that in a developing country, like ours, agricultural producers live in conditions of poverty due to the low price their products have on the market. This forces people either to abandon fields, or if they have some resources, to implement environmentally unfriendly technologies to get more production, and a higher income.

Support offered by the UNEP and the IICA primarily serve to articulate three processes:

- Training in technology and organization for agricultural production to eliminate, or significantly reduce the use of industrial fertilizers and pesticides.
- Training in technology and organization for producers to process crops themselves instead of selling them, using environmental friendly techniques.
- Access to markets that can pay a fair price for products produced with social and environmental responsibilities (Fig. 2.25).

After many negotiations with governments from different countries, the Framework Convention was created. Developed countries pledged to reduce the number of projects that contribute to the emission of greenhouse gases in developing countries.

Although climate change is mostly due to fuel burning, food production also contributes in different ways, the two most known are: 1) Methane emission, a gas that is one of the causes of the greenhouse effect, which is produced in significant quantities by cattle, and 2) Emission due to deforestation to create new techniques for agricultural production. In the former, the administration of protein in cattle feed is being promoted to improve the animals' digestion and reduce the emission of methane. In the case of the latter, there is a negotiation for payment when there is a reduction of emissions due to the deforestation and degradation process.

→ Expected Learning

Identify the importance of initiatives promoting sustainability such as The Earth Charter and United Nations Environment Program for climate change.



FIG. 2.25 Organic coffee in shade production cooperatives have had remarkable results improving life quality of peasant families.

SESSION INFORMATION

Week: 15

Session: 85

Expected learning outcome: Identify the importance of initiatives promoting sustainability such as The Earth Charter and United Nations Environment Program for climate change.

CONTENT DELIVERY

Start: Students should read page 53 and find what the UNEP and the IICA do.

Development: Once they find the information, they should decide what should be done towards sustainable development.

Closing: They should present their proposals.

SKILLS DEVELOPMENT

Critical thinking skills: Problem solving

Reading skills: Scanning.

EVALUATION OF CONTENT

Students should present the problem and proposals.

SESSION INFORMATION

Week: 15

Session: 86

Expected learning

outcome: Identify the importance of initiatives promoting sustainability such as The Earth Charter and United Nations Environment Program for climate change.

CONTENT DELIVERY

Start: Ask students what they remember UNEP and IICA do.

Development: They should do the hands on project. Follow instructions in the book page 54.

Closing: Students should present their project.

Although there are a variety of proposals, they have in common the recognition of the right of others to exist and to develop completely. "Others" can refer to either nature, or "other" people or cultures.

→ HANDS ON

Earth Charter

The Earth Charter is an initiative launched by civil organizations to address environmental and social issues of the modern world. This document establishes a set of principles around the following areas:

- I. Respect and care for the community of life.
- II. Ecological integrity.
- III. Social and economic justice.
- IV. Democracy, no violence, and peace.

- Get at least one copy of the Earth Charter, and make four photocopies. You can get a copy at the following web page:

<http://earthcharterinaction.org/contenido/pages/Lea-la-Carta.html>

- Make up four teams. Each team should choose one of the areas in which the document is organized.
- Each team will have a discussion panel with principles of the chosen area, and the last section entitled "the way forward" will be read.
- Each team will talk about:
 - Do I agree, or not with each principle? Why?
 - How are the principles of the chosen area related to everyday life in your community, home, and school?
 - What problems could we have when trying to apply these principles in everyday life, and in the community?
 - Finally, each team will choose two or three problems to present their conclusions to the group.

Note 1. Remember that everybody should participate in the conversation.

Note 2. In your conclusions, you should mention if there was a point in which no agreement was reached.

SO FAR YOU HAVE LEARNED THAT...

- There are technological advances to satisfy the population's food needs.
- Some environmental problems are related to food technology.
- It is important to make changes in food production and consumption patterns to achieve sustainable development.
- The relevance of the initiative of international and citizen organizations to mitigate environmental problems and favor sustainable development. In all cases you emphasized the relation these initiatives have, or could have in production.

54

Kells

SKILLS DEVELOPMENT

Critical thinking skills: Problem solving.

Interpersonal skills: Working as a team.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Project

Towards the Creation of a Responsible and Involved Citizenship

1 Introduction

We are suggesting a topic for your project. No matter which topic is of your interest, it is important to take into account the time available so you can establish reachable objectives.

- How can I produce my own food to have a balanced diet with good use of the resources, knowledge and habits of the place where I live?
- How to create a vertical orchard?

→ THE CHALLENGE

Your job consists of thinking, investigating and evaluating different alternatives to solve your project task, so you can choose and implement the most suitable one.

2 Project

Find alternatives that may answer this project's question. If you are interested in food production, there are alternatives that may be implemented at home, school or your community; for example, a vertical garden or an vegetable garden in a little parcel (Fig. 2.26).

Another option could be to choose a project focusing on the consumption of food instead of its production. This way, you will help the students in your school or the people in your community to have a suitable diet.

Get the best sources of information at your disposal, there may be more than you think; you can find them in your school library, classroom library, a public library in your area or neighborhood. Keep in mind the Internet is also a source of information, another important source is the people we have nearby.

Once you have obtained information, get together to evaluate it, and then decide which project you will work on. Identify the advantages and disadvantages of the options that you have.

3 Perform

Now you can plan your work using the following suggestions:

1. Establish the tasks to be carried out.
2. Assign roles based on the preferences or abilities of each of the team members. However, remember everyone must participate; the project must be the result of collaborative work.
3. Design a schedule of activities, keeping in mind you must include the follow up activities and evaluation of your work.



FIG. 2.26 Vertical garden.

55

SESSION INFORMATION

Week: 15

Sessions: 87, 88

Expected learning outcome: Students will use the unit information to develop a project.

CONTENT DELIVERY

Students should read the project and agree on how they will be presenting it. During the following sessions, they will give their project presentations. Follow the project rubrics to evaluate it.

SKILLS DEVELOPMENT

Reading skills: Scanning.

Critical thinking skills: Formulating questions.

Listening skills: Understanding information, self-monitoring, self evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 15

Sessions: 89, 90

Expected learning

outcome: Students will use the unit information to develop a project.

CONTENT DELIVERY

Students should read the project and agree on how it should be presented, During the project presentations, follow the rubrics to evaluate it.

4 Share

It is important to inform your results, because all the research that you do may be very useful to other people, the options for sharing your project are many, depending on which you have decided to follow; use your imagination so your research can reach as many people as possible and have the greatest impact (Fig. 2.27).

5 Assessment

Finally, it is important to evaluate your project; you can discuss your experience dealing with problems that you faced during the development of your project, and how you solved them; you should also highlight the benefits that you obtained. The following questions can help you in this process:

1. About team work:

- How did you feel during the project?
- What did you like the most?
- What you did not like and how can you solve it in the following projects?

2. About the research task:

- What sources of information were new for you?
- Could you have used other ones? Which ones?

3. About the product that you prepared:

- Did you meet all your objectives?
- If not, why?
- Do you consider that the final outcome could have been better? How could you improve it?

FIG. 2.27 Share what you know about the health benefits of fruits and vegetables.



56

SKILLS DEVELOPMENT

Reading skills: Scanning.

Critical thinking skills: Formulating questions.

Listening skills: Understanding information, self-monitoring, self evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Evaluation

John likes chicken with mole very much, and he frequently eats it, but now he is concerned about improving how he eats, so he asks you: What should I add to this dish to make it healthier?

1. Taking the "Eatwell plate" into account, you recommend him to:

- a) Eat it with tortillas or rice including some vegetables.
- b) Add cream and eat it with a salad.
- c) Eat only the chicken without mole.
- d) Eat it with rice and tortillas and add cream, cheese and onion.

2. How could you explain to John what an "Eatwell plate" must contain?

- a) The food groups that a healthy dish must contain.
- b) Each meal must contain the necessary nutrients that your body needs.
- c) The meals that you should eat during the day to have a healthy diet.
- d) The nutrients that the different food groups contain.

3. A healthy healthy diet must contain the following attributes: sufficient, complete, varied, balanced, safe and adequate. Match the word and definition by writing the corresponding letter in the parentheses.

ATTRIBUTE

- Enough (a)
- Complete (a)
- Adequate (a)

DEFINITION

- a) All kinds of nutrients contained in it.
- b) Must be according to taste and culture consumers, and to adapt to each income.
- c) Meets everyone's needs.

An investigator placed an aquatic plant called Elodea in a closed glass tube, adding carbonated water (in which carbon dioxide is produced), and a bit of air, shown in fig. 2.28. Afterwards, he left the tube exposed to the light for several hours and analyzed the composition of gases inside.

4. What would happen with oxygen and carbon dioxide?

- a) The amount of oxygen would be decreased and the carbon dioxide increased.
- b) The amount of oxygen would have increased and the carbon dioxide decreased.
- c) The amount of both gases would have increased.
- d) The amount of both gases would have remained the same.



FIG. 2.28 Elodea.

57

SESSION INFORMATION

Week: 16

Sessions: 91 - 93

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 57 and 58 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 118 to 120 along with the answer key 121.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

SESSION INFORMATION

Week: 16

Sessions: 94 - 96

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 57 and 58 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 118 to 121 along with the answer key.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

5. If the tube had been covered so that no light could reach the Elodea, which of the following statements would be true?

- a) The amount of oxygen would increase.
- b) The amount of carbon dioxide would decrease.
- c) The oxygen would not have increased its amount.
- d) Both gases would disappear.

You observed in this unit food structures, the flow of matter and energy in ecosystems through predator - prey relationships, and how these relationships have developed several adaptations through evolution.

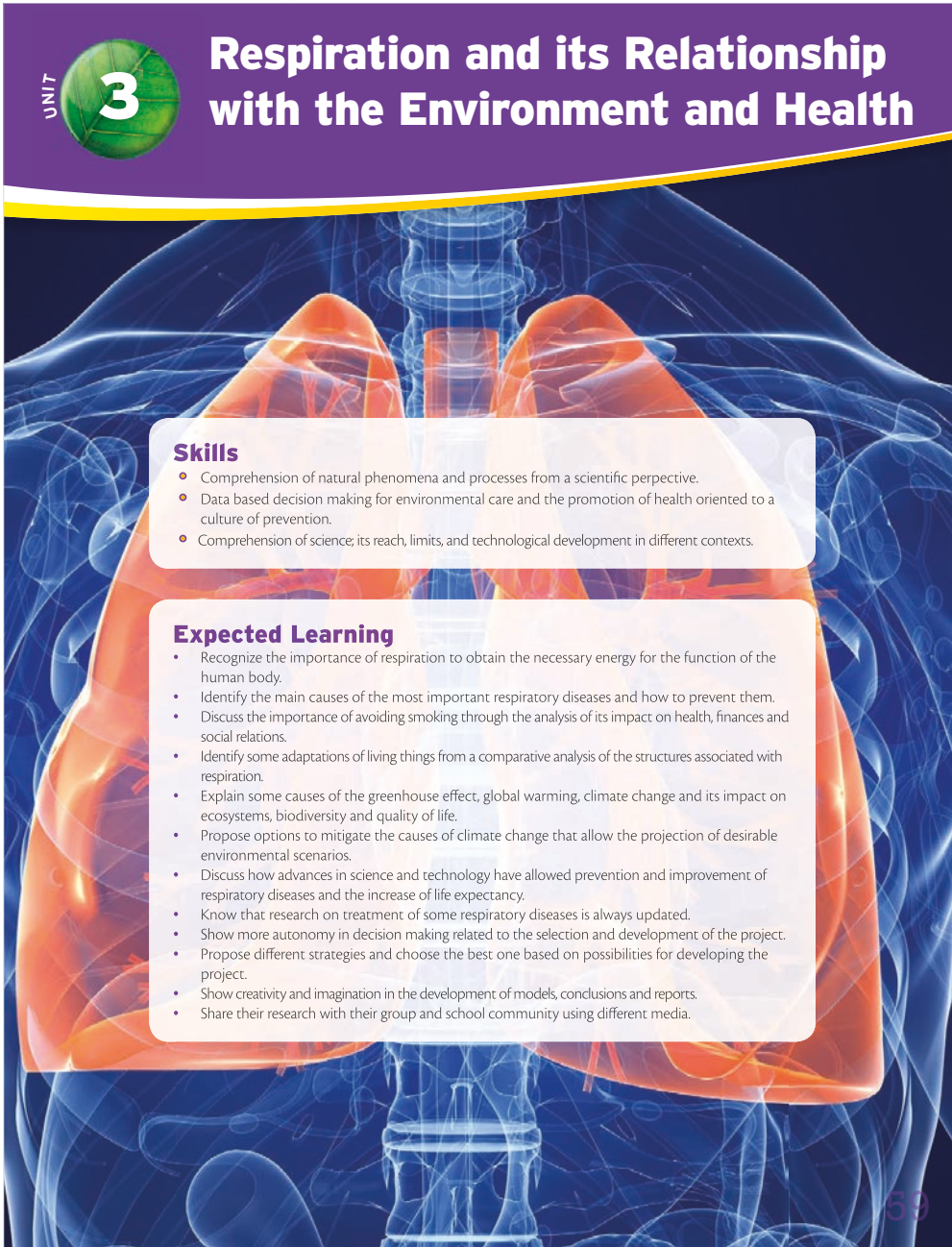
6. Matter and energy flow in ecosystems:

- a) Cyclically, so energy and matter exist in the same amount.
- b) In different ways, matter flows in cycles without changing its amount, but energy is lost at a trophic level.
- c) Partially lost at each trophic level.
- d) Energy flows in cycles without changing its amount, in different ways, but matter is lost at a trophic level.

7. Examples of feeding adaptations in carnivorous predators are:

- a) Tusks, rumination, and mimetism.
- b) Flight, running speed, and better smell and sight than the prey.
- c) An intestinal tract larger than the prey in order to digest consumed meat.

Respiration and its Relationship with the Environment and Health



Skills

- Comprehension of natural phenomena and processes from a scientific perspective.
- Data based decision making for environmental care and the promotion of health oriented to a culture of prevention.
- Comprehension of science; its reach, limits, and technological development in different contexts.

Expected Learning

- Recognize the importance of respiration to obtain the necessary energy for the function of the human body.
- Identify the main causes of the most important respiratory diseases and how to prevent them.
- Discuss the importance of avoiding smoking through the analysis of its impact on health, finances and social relations.
- Identify some adaptations of living things from a comparative analysis of the structures associated with respiration.
- Explain some causes of the greenhouse effect, global warming, climate change and its impact on ecosystems, biodiversity and quality of life.
- Propose options to mitigate the causes of climate change that allow the projection of desirable environmental scenarios.
- Discuss how advances in science and technology have allowed prevention and improvement of respiratory diseases and the increase of life expectancy.
- Know that research on treatment of some respiratory diseases is always updated.
- Show more autonomy in decision making related to the selection and development of the project.
- Propose different strategies and choose the best one based on possibilities for developing the project.
- Show creativity and imagination in the development of models, conclusions and reports.
- Share their research with their group and school community using different media.

SESSION INFORMATION

Week: 17

Session: 97

Expected learning

outcome: Recognize the importance of respiration to obtain necessary energy for the integral function of the human body.

CONTENT DELIVERY

Start: Explain to students the grading criteria, projects requirements, and expected learning outcomes of the unit. Students need to know the dates when the last project should be presented.

Development: Students should organize their presentations in teams. Form teams of four people. It's important that you form the teams to guarantee no one is excluded. Explain the first project presentation: Students should read pages 60 and 61. Segment the information.

Closing: Then, they should do further research to explain how the respiratory system works. Ask for a clear explanation, posters, and a set of four questions to ask their partners for comprehension and collaborative work.

SKILLS DEVELOPMENT

Interpersonal skills: Mediating, working as a team member.

Metacognitive skills: Planning, organizing.

EVALUATION OF CONTENT

Students should explain what each member of the teams should do in the project to make clear everybody has a task to perform.

SESSION INFORMATION

Week: 17

Sessions: 97, 98

Expected learning

outcome: Recognize the importance of respiration to obtain necessary energy for the integral function of the human body.

CONTENT DELIVERY

Start: Make sure you have a poster with the respiratory system in case students fail bringing something clear or well done.

Development: Students should give their presentations. Help accordingly to guarantee the information is clear. Ask a student to write a glossary of terms they do not get clearly.

Closing: Have them ask their questions to check comprehension. Then, they should self-evaluate and self-correct their project according to the projects rubrics parameters, page 132.

→ Expected Learning

Recognize the importance of respiration in obtaining the necessary energy for the integral function of the human body.

GLOSSARY

Cilia. Very thin filaments which coat the trachea, filter and eliminate the impurities that enter the respiratory system.

Cartilage tissue. This is a part of the skeleton of boned animals, it is resistant, but flexible. It has different functions in the body, for example, in the respiratory system it does not allow nostrils ducts, larynx, trachea, and bronchia to close.

Alveoli. Set of cavities in the lungs that perform the exchange of gases with inhaled air.



FIG. 3.1 Respiratory system scheme.

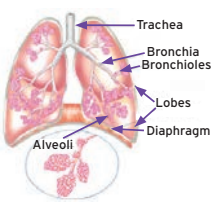


FIG. 3.2 In the lung alveoli, carbon dioxide is exchanged with oxygen coming from the blood.

Relationship Between Respiration and Nutrition as a Source of Energy for the Human Body to Work Correctly

→ Reflect

Answer in your notebook:

- What happens to oxygen after it enters the lungs?
- How is energy obtained from food?
- How is respiration related to blood flow?

We could assume that breathing consists only of inhalation and exhalation, but it really implies much more. Breathing is a complex process in which we obtain the energy to perform our vital functions.

We all know how to breath since it is a vital function, however, have you ever asked yourself, what happens to air after it enters the body? Is incoming air different once it is exhaled? Does something remain in the body?

Let's imagine it's possible to travel along with the inhaled air; let's follow the route inside the respiratory system (Fig. 3.1). We start our trip inside the nose: air is introduced through the nostrils to the nasal cavity, where it is heated and moisturized; thus we avoid damage to the nose and throat from cold air. In this part of the route there is a lot of mucus and there are many hairs known as **cilia**, which serve as protection; they prevent dust and bacteria from going into the respiratory conducts.

Once air has been filtered, it goes through the **pharynx** (throat) and **larynx**; underneath the larynx we travel to the **trachea**, a tube whose walls are reinforced with **cartilage tissue** rings, that prevent the trachea from closing during inhalation.

In the thorax, the trachea is divided in two parts called bronchia, they allow part of the air to go into the left lung, and another part to the right one. Bronchia also have rings and walls with cilia. In its path through each bronchi, air passes through smaller conduits called bronchioles. Finally, the air arrives to tiny sacks called **alveoli** (Fig. 3.2). Human lungs contain about 700 million alveoli which contains a great quantity of capillaries.

Why would it be important for alveoli to have contact with blood capillaries? When air reaches the alveoli (filtered, warm, and humid) something very important happens; but before explaining it you should know that air is a mix of gases, including oxygen, nitrogen, and carbon dioxide as well as other gases such as water vapor.

60

SKILLS DEVELOPMENT

Metacognitive skills: Delivering information, self-evaluating, self-monitoring.

Speaking skills: Delivering information.

Critical thinking skills: Defining concepts, formulating questions.

EVALUATION OF CONTENT

Students should respond to the comprehension check questions. Follow the Teacher's Guide projects rubrics on page 132.

When blood passes through the alveoli, an exchange of gases takes place in the air: Oxygen leaves the air and goes into the blood as carbon dioxide, then, it leaves the blood and is released into the lungs. At this moment, the flow of inhaled air changes, as part of it is exhaled while the oxygen is incorporated into the respiratory system or the cardiovascular system.

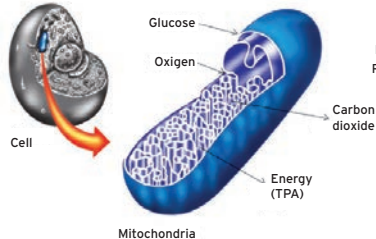
Air travels inside blood cells called red cells, or erythrocytes, which have an oval shape similar to a doughnut and are colored red due to **hemoglobin**. Oxygen is mixed with this substance to travel in the blood; this mixture is called oxyhemoglobin. Oxyhemoglobin is transported in red cells through arteries to the cells which need it. All the blood cells need it to get energy.

How do we get energy from oxygen? For living things to use energy found in glucose, we need an extra element to degrade it. This important element is oxygen. With it, a process of combustion takes place, it is so slow that it does not generate flames, but turns into energy.

Oxygen in air and glucose in food are transported from the blood to the tissues in the body (Fig. 3.3). They are introduced to each one of the cells, and once inside, they pass to organelles known as **mitochondria** (Fig. 3.4).

Mitochondria are known as the cell energy generators because inside them, oxygen and glucose are mixed producing energy and carbon dioxide. The energy that mitochondria produce sticks in a new molecule: adenosine triphosphate (TPA), which is the unit of energy living things function with.

FIG. 3.4 Mitochondria are the cellular organelles where respiration takes place.



The process of respiration is divided into three stages:

1. External respiration. When we inhale air through the nostrils and mouth up to the lungs. A common idea is that lungs move by themselves, but their movement is due to a muscle, underneath the lungs, which is called diaphragm.
2. Internal respiration. It is the circulation of the oxygen from the lungs to the cells.
3. Cellular respiration. Takes place in the mitochondria when oxygen mixes with glucose producing TPA.

GLOSSARY

Hemoglobin. Protein in the blood of a characteristic red color that conducts the oxygen from the respiratory organs to the tissues.

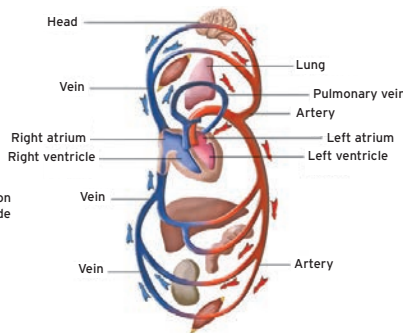


FIG. 3.3 Arteries look red because they have oxygenated blood, veins look blue because they do not have oxygen, they have carbon dioxide. The arrows show the direction in which blood circulates.

SESSION INFORMATION

Week: 17

Sessions: 99, 100

Expected learning outcome: Recognize the importance of respiration to obtain necessary energy for the integral function of the human body.

CONTENT DELIVERY

Start: Make sure you have a poster with the respiratory system in case students fail bringing something clear or well done.

Development: Students should give their presentations. Help accordingly to guarantee the information is clear. Ask a student to write a glossary of words they do not get clearly.

Closing: Have them ask their questions to check comprehension. Then, they should self-evaluate and self-correct their project according to the rubric parameters.

Project preparation: Students should read page 62 and in teams, prepare it. The following class they will either do it in the lab or present their results. Follow the projects rubric parameters.

SKILLS DEVELOPMENT

Metacognitive skills: Delivering information, self-evaluating, self-monitoring.

Speaking skills: Delivering information.

Critical thinking skills: Defining concepts, formulating questions.

EVALUATION OF CONTENT

Students should respond to the comprehension check questions. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 17

Sessions: 101, 102

Expected learning

outcome: Recognize the importance of respiration to obtain necessary energy for the integral function of the human body.

CONTENT DELIVERY

Start: Ask students comprehension check questions on how the respiratory system works.

Development: Students should either do the lab practice or present their findings.

Closing: Students should complete the table 3.2 and answer the questions that follow it.

Project preparation:

Students should read pages 63 and 64. (Segment the information) besides doing further research on the flu, cold, bronchitis, pneumonia. They should present: Disease, causes, symptoms, and preventive actions.

In the lab

How can it be shown that we exhale carbon dioxide?

Indicators are substances which once mixed with others, produce a reaction recognizable at a glance. Two substances that help answer the question are lime and bromothymol blue.

Table 3.1

Indicator	Reaction
Bromothymol blue	Changes from blue to yellow when carbon dioxide is present.
Lime	Lime water muddies and tiny granites form and go to the bottom.

Do the following activity:

Material

- A transparent water glass
- Straw
- Lime water or bromothymol blue substance

Procedure

1. Fill the glass to the middle using the indicator.
2. Take note of the liquid's initial color.
3. Carefully, without spilling the liquid, blow inside the glass using the straw to make bubbles.
4. Observe the liquid until you see some changes, or stop after 10 minutes if there is no change.
5. While doing the experiment complete table 3.2.

Table 3.2

Time (minutes)	Was there any change?	Describe your observations
2		
4		
6		
8		
10		

Answer in your notebook:

- Were there any changes in the water?
- Why do you think this happened?
- Are the results the same as the answers at the beginning of this activity? Why?

Compare your results with the other teams: Was the result the same for all the teams? In how many teams was the result different? Why do you think this happened?

Kells

62

SKILLS DEVELOPMENT

Critical thinking skills: Analyzing, observing, comparing and contrasting, inductive reasoning, experimenting.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

The table and answers to the questions should be completed. Follow the Teacher's Guide projects rubrics on page 132.

Analyzing some Causes for Most Common Respiratory Diseases: Influenza, Cold, and Pneumonia. Identifying Preventive Measures

The main causes for respiratory diseases are: climate, **microbes** and personal characteristics. Among the main causes related to climate are, for example, sudden temperature changes. Our proteins and antibodies function better at 37°C. Cold temperature causes the bodies defenses to weaken, allowing microorganisms to develop, then we get sick. Another factor is humidity, which allows microbes such as bacteria to live longer.

Particles found in air pollution can enter respiratory tracts. These particles are so tiny that they can reach the lungs and cause diseases. Other causes for respiratory diseases are viruses (Fig. 3.5a) and bacteria (Fig. 3.5b) which are known as microbes. They enter the body and set up in it, this means, they infect the body.

Some people can be more resistant than others to external factors. This is due to the condition of their **immune system**. Nutrition, age, and, physical condition are factors that contribute to the possibility of developing respiratory diseases. They can be classified into mild, moderate, and severe; to identify them, physicians rely on the symptoms of the ill person.

There are other diseases caused by the obstruction of conducts, such as allergies and asthma. **Asthma** is an obstruction of the conducts which keeps air from entering into the lungs. This is more common in young people. The obstruction is due to swollen bronchi

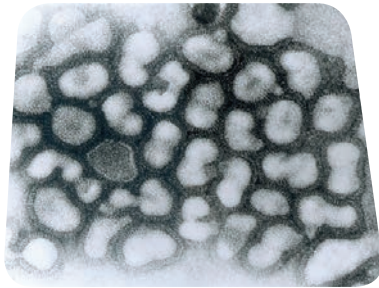
→ Expected Learning

Identify the main causes of the most common respiratory diseases, and how to prevent them.

GLOSSARY

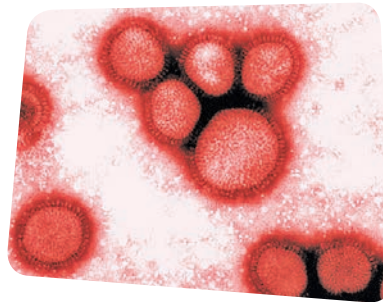
Microbes. Tiny living things that can be seen only with the help of a microscope.

Immune system. Organs and biological processes that protect us against diseases.



a)

FIG. 3.5 a) Influenza A virus; b) Streptococcus pneumonia bacteria.



b)

63

SESSION INFORMATION

Week: 18

Sessions: 103 - 105

Expected learning outcome: Identify the main causes of the most common respiratory diseases and how to prevent them.

CONTENT DELIVERY

Start: Make sure you prepare the explanation to common respiratory diseases to guarantee students get the information from the sequence.

Development: Students should give their presentations. Help accordingly. As teams give their presentations, See the table below, have them complete it.

Closing: Students should have them self-monitor and self-correct their presentation

SKILLS DEVELOPMENT

Critical thinking skills: Defining concepts, ordering, classifying.

Logical/Mathematical skills: Organizing data.

Metacognitive skills: Self-monitoring, self-correcting.

EVALUATION OF CONTENT

Check students' charts. Follow the Teacher's Guide projects rubrics on page 132.

Table to be completed

Disease	Causes	Symptoms	Preventive actions

SESSION INFORMATION

Week: 18

Sessions: 106 - 108

Expected learning

outcome: Identify the main causes of the most common respiratory diseases and how to prevent them.

CONTENT DELIVERY

Start: Make sure you prepare the explanation to common respiratory diseases to guarantee students get the information from the sequence.

Development: Students should give their presentations. Help accordingly. As teams give their presentations, have them complete a chart like the one from previous session.

Closing: Students should have them self-monitor and self-correct their presentation.

Project preparation:

Students will analyze personal social risks of smoking. Therefore, set teams of four or five. They should read pages 65-66 and do further research on why smoking is dangerous. They should include: Key concepts as types of smokers, diseases provoked by smoking, tobacco consumption classification, and posters.



FIG. 3.6 Sneezing is one of the most common symptoms of infectious respiratory diseases, and allergies.

not allowing air to go into the lungs. Asthma can be triggered by dust, pollen, and animal hair, among others. It is a chronic disease, this means that it can be treated, but not cured. Allergies are the body reacting to factors that in other people may not cause problems. Most allergies are active at certain times of the year, for example, in spring and summer when people react to pollen in the air. They sneeze repeatedly; this is the body's defense mechanism which puts us on alert of some foreign agent (Fig. 3.6).

Chronic obstructive pulmonary disease, includes some diseases like chronic bronchitis, and pulmonary emphysema. The most common symptoms are a constant cough with phlegm, and lack of air when performing physical activities or efforts. A lot of people suffer from pulmonary disease without knowing it.

Now that you know more about diseases that affect respiratory processes, let us see some recommendations that can help our respiratory system:

- Inhale through your nose, not your mouth.
- Frequently perform deep inhalations outdoors.
- Exercise outdoors, walking, or biking.
- Avoid poorly ventilated places.
- Eat fruits and vegetables.
- Avoid sudden changes of temperature.
- Do not smoke, and avoid being in a place with smokers.
- Avoid contact with sick people.

HANDS ON

In teams, discuss the recommendations above; choose five which you find most helpful, and complete table 3.5; look at the example.

Table 3.5

ACTION	REASONS FOR DOING IT
1. Eat fruits and vegetables	They provide A and C vitamins that strengthen the respiratory system
2.	
3.	
4.	
5.	

Kells

64

SKILLS DEVELOPMENT

Critical thinking skills: Defining concepts, ordering, classifying.

Logical/Mathematical skills: Organizing data.

Metacognitive skills: Self-monitoring, self-correcting.

EVALUATION OF CONTENT

Check students' charts. Follow the Teacher's Guide projects rubrics on page 132.

Smoking: Analyzing Personal and Social Risks

Every day over 10 thousand people die due to diverse fatal diseases caused by a legal drug: tobacco. If we do not do something, by the year 2020, 25 thousand people will die every day because of tobacco. This disease is called smoking or nicotine poisoning, and you are part of the population at risk.

Mexico joined the World Health Organization endeavor to enforce the Frame Agreement for Tobacco Control. In our country, 23.5% of productive age people (between 15 and 64 years old) smoke, causing absences from work because they require health services to be cured from illnesses related to smoking; those consultations and treatments (when dispensed by public institutions) are very expensive for the State. So, many campaigns have been made to prevent smoking.

Even though passive or second hand smokers do not smoke, they are at the same risk as smokers of getting some kind of respiratory sickness and die from emphysema, lung cancer and COPD (Chronic Obstructive Pulmonary Disease), or EPOC (Enfermedad Pulmonar Obstructiva Cronica) in Spanish (Fig. 3.7).

Also true is the fact that, according to national surveys on addictions, people who smoke, occasionally develop chronic diseases (throughout their lives) like cancer, emphysema and COLD, among others, which will lead to poor quality of life, due to bad health.

Besides its social and medical consequences, smoking has financial repercussions, since resources used to treat sick people could be used for other purposes.

Regarding the consumption of tobacco, people are classified within one of the following categories:

Classifying people by their tobacco consumption

- Non-smoker: Has never smoked tobacco
- Smoker: Currently smokes, or has been smoking cigarettes, cigars, or pipes with tobacco for a year.
- Ex-smoker: At least one year ago smoked his/her last cigarette, cigar or pipe.
- Passive smoker: Inhales cigarette smoke from people smoking around him/her.

→ Expected Learning

Discuss the importance of not smoking, through the analysis of its impact on health, financial and social relations.

FIG. 3.7 In order to protect non-smokers, laws that prohibit smoking in public places like your school have been created.



65

SESSION INFORMATION

Week: 19

Sessions: 109 - 111

Expected learning outcome: Discuss the importance of not smoking, through the analysis of its impact on health, financial and social relations.

CONTENT DELIVERY

Start: Show a picture of healthy lungs and a picture of lungs with cancer or emphysema. You might want to show a picture of people with cancer in the mouth or without it. Ask students to observe them and write differences they see. Tell them that it is the reason why they are going to analyze smoking.

Development: Students should give their presentations. Help accordingly. Make sure the key concepts are mentioned and thoroughly explained.

Closing: Students should make a mind map with the information they listen. Other option is that they create a rap in which they narrate the story of a smoker who died from emphysema and what he could have done to prevent it.

SKILLS DEVELOPMENT

Vocabulary skills: Scanning, Using didactic aids.

Critical thinking skills: Defining concepts.

Visual/Spatial skills: Mind mapping.

Musical skills: Rapping.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 19

Sessions: 112 - 114

Expected learning

outcome: Discuss the importance of not smoking, through the analysis of its impact on health, financial and social relations.

CONTENT DELIVERY

Sessions 112, 113

Look at the previous page to see how to carry out the procedure for this page.

Session 114

Development: It's a really good idea to do the *hands on* role-play explained on page 66. Students should play a character and debate.

Closing: Make them see the importance of living without addictions.

SO FAR YOU HAVE LEARNED THAT...

- Breathing is a vital process that human beings perform in three phases: External, internal and cellular.
- Breathing is not only inhaling and exhaling, but it also carries oxygen to cells to process glucose.
- Breathing, nutrition, and circulation are intimately related to obtain energy to live.
- Most frequent respiratory diseases are flu and colds that can be prevented.
- Air pollution increases the appearance of respiratory diseases, so actions must be enforced to prevent them.
- Smoking can cause emphysema or obstruction of the respiratory system, as well as death.
- We must avoid smoking and convince others not to smoke.

At the same time, smokers are divided into:

- Light smoker: Less than five cigarettes a day.
- Moderate: Six to fifteen cigarettes a day.
- Severe: Sixteen or more cigarettes a day.

Pregnant women must not smoke, nor be close to smokers, because smoke substances go into their blood, as well as the baby's; should this happen, there might be consequences like premature birth. It has also been proven that children from smoking mothers weigh less when they are born. Smoke released from burning tobacco has close to 4,000 chemical substances; out of those, more than 40 cause cancer. Many others are strong irritants and even poisons, such as the following:

- Nicotine: many people smoke because they say they feel good; this is due to nicotine which, like any other drug, acts upon the brain, alters it and changes its functions.
- Tar: most of its components cause cancer, and it is considered a toxic residue.
- Hydrogen cyanide: Present in cigarette smoke in small amounts; powerful poison.
- Carbon monoxide: Very toxic gas which competes with oxygen to join hemoglobin, thus blocking breathing.

Smoking not only affects the respiratory system, also the heart and may cause cataracts, increase the risk of kidney, pancreas, and liver cancer, among other consequences. Besides, these chemical substances cause bad breath and stained teeth.

→ HANDS ON

Organize a skit or a debate about smoking. If you do the skit, some of your classmates have to act out certain roles; for example:

- Owner of a cigarette factory: Defends commercial ads about cigarettes.
- Severe smoker: Has disease symptoms, but cannot quit smoking.
- Pregnant woman: Is afraid her son or daughter is born with some problem.
- Ex smoker: Quit smoking because he does not want to die of cancer, but it was very hard for him to quit.
- Woman second hand smoker: Cannot do anything because she lives with smokers.
- A doctor: Gives advice and provides information.
- Two students (male and female): She wants him to start smoking, and he does not like advertising and media to control his likes and actions.

You can discuss points like: Is it worth it to live sick and die from a disabling illness? How would the owner of the cigarette factory defend his ads about cigarettes? How would the student who wants to start smoking react? What would the sick man tell him? What would the ex-smoker's advice be for him?

66

SKILLS DEVELOPMENT

Bodily/Kinesthetic skills: Roleplaying.

Speaking skills: Discussing.

Critical thinking skills: Problem solving.

EVALUATION OF CONTENT

Students should have completed a mind map with all the information from pages 65-66 and any other piece of information.

A Comparative Analysis on some Breathing Adaptations of Living Things

Reading

How come elephants have such long trunks?

When we see an elephant, besides its big size, what gets our attention is its proboscis (trunk). What we do not know is that it is the evolutionary result of the enlargement of the upper lip and nose of ancestors that lived in Africa, approximately 60 million years ago, and was called *Moeritherium*. They were animals as large as pigs, and with a nose similar to that of a modern tapir.

As you can see, in figure 3.8, the evolving line made with DNA results, showed that mammoths were more like Asian elephants than African elephants. It is also known that manatees and hyraxes are close relatives to elephants, this really shows how different adaptations in living things can be. Respiratory systems in living things have evolved through

time, and we will study how these changes took place.

Most people think that plants do not breathe, because they do not have a respiratory system like ours. Microbes, and even worms, do not have a respiratory system but they do breathe.

In this sense, we are alike because we get the energy we need through an exchange of gases, what varies is the way of doing it. Living things, have different adaptations, depending on the habitats.



Expected Learning

Identify some adaptations of living things, from a comparative analysis of the structures associated with respiration.

FIG. 3.8 Even hairy Mammoths and manatees show adaptations of respiratory systems.



Adaptations in animals.

Living things or creatures need energy to live and must obtain oxygen to burn glucose. Breathing allows us to obtain energy stored in food.

Most living creatures must be able to get oxygen and release carbon dioxide in their environment (terrestrial or aquatic). Several ways of gas exchange exist, but it always takes place through a humid area.

In most uni-celled organisms, gas exchange is performed simply through the cell's membrane; and since most of them live in aquatic environments, oxygen dissolved in water is transferred inside, while carbon dioxide is transferred outside. Green algae and amoebas are examples of the above.

Kells

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SESSION INFORMATION

Week: 20

Session: 115

Expected learning outcome: Identify some adaptations of living things, from a comparative respiration associated structures analysis.

CONTENT DELIVERY

Start: Have students exercise the 4-7-8 breathing technique. (Counting to 4, inhale, counting to 7 keep the air inside, and counting to 8 exhale through the mouth). This breathing technique is widely known for calming down people or even putting them to sleep when they suffer from insomnia.

Development: Students will work in pairs. One of them should read to the other the article: How come elephants have such long trunks? Then, the second one should retell what he listened in his own words. Then, they should go back to the article and underline new words they find; later, they will look for the words in the dictionary.

Closing: Students should retell the article in their own words but only in one or two sentences.

Homework: Ask students to take to school cardboards, ruler, markers for the following 3 sessions.

SKILLS DEVELOPMENT

Bodily/Kinesthetic skills: Controlling breathing.

Vocabulary skills: Word referencing.

Reading skills: Scanning.

Critical thinking skills: Summarizing.

EVALUATION OF CONTENT

Their oral summary on the article.

SESSION INFORMATION

Week: 20

Sessions: 116 - 118

Expected learning outcome:

Identify some adaptations of living things, from a comparative respiration associated structures analysis.

CONTENT DELIVERY

Start: Students should name how humans do the respiration process. Prepare 9 cards and play tic tac toe. Write incomplete sentences in each card and students must complete them in order to name the whole respiration process.

Development: Students will read pages 67 – 69 in order to build a chart with the data. The chart should include:

Type of animal
Breathing type
Breathing structure

Closing: Students should display their charts on the wall.

Homework: Ask students to take to class an insect or a lizard or a fish or a plant.

Earthworms get oxygen through their skin. Underneath they have a great amount of vesicles which take oxygen from the outside and release carbon dioxide. Since the process is performed through their skin, it is called cutaneous or skin breathing. Most terrestrial invertebrate animals (boneless), such as insects or spiders, have thin tubes called tracheas, which are distributed through their entire body. This internal tubing system drives the air from outside to the body's inside. That is why they have tracheal breathing (Fig. 3.9).

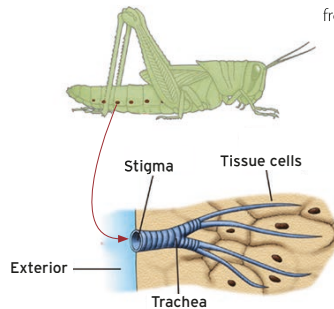


FIG. 3.9 Tracheas penetrate the insect's body carrying oxygen up to where it is needed.

In aquatic organisms such as fish, breathing is carried out by gills. Gills have a dark red color; this is because they have many blood vessels. Oxygen enters fish through the gills; oxygen in water is diffuse and bonds with hemoglobin, which, as you know, carries oxygen inside the body through the circulatory system, and comes back to the gills where it is released as carbon dioxide.

All living creatures breathe to obtain energy which allows performance of all the functions that keep us alive. Life had its origin in the seas and has evolved to occupy terrestrial and aerial environments; living things have adapted to different media and have specialized organs to perform gas exchange according to the environment where they live.

Respiratory structures have been evolving for millions of years. Living things, that present better characteristics for the environments they inhabit, are able to survive. Breathing types and gas exchange structures are examples of adaptations which emerged by means of gradual and slow processes through the history of organisms on the planet, which started approximately 3,500 million years ago (Fig. 3.10).

GLOSSARY

Gills. Fish and other aquatic animals breathe with these, and with which they get oxygen dissolved in aquatic environments.

Diffusion. Natural process whereby a gas or liquid passes from a higher concentration zone to a lower concentration zone.

Hemoglobin. The part of blood that contains iron, carries oxygen through the body, and gives blood its red color.

Adaptations in plants.

In the Vegetable Kingdom, breathing in uni-celled organisms such as seaweed, is similar to that of protozoa; they diffuse oxygen dissolved in water through cell membranes. In general, terrestrial plants exchange gases with the environment by means of specialized structures called stomata and lenticels.

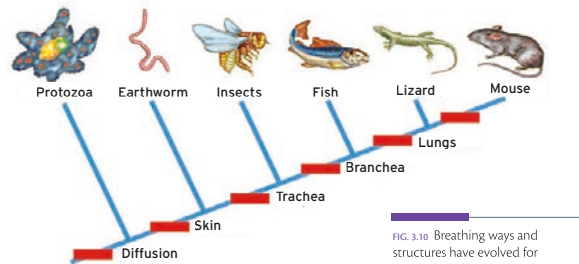


FIG. 3.10 Breathing ways and structures have evolved for thousands of years.

SKILLS DEVELOPMENT

Critical thinking skills: Analyzing.

Naturalistic skills: Categorizing.

Logica/Mathematical skills: Discovering relations.

Visual/Spatial skills: Charting.

EVALUATION OF CONTENT

Their chart should be complete and clear.

Stomas are groups of two or more cells which make up an opening in the plant's crust, to allow or block gas exchange. Plants breathe too, they absorb oxygen and release carbon dioxide, but the CO₂ they expel, is less than that used in the photosynthesis process (Fig. 3.11).

Lenticels are oval structures which allow air to enter internal tissue. Unlike stomas, they are found in young roots, stalks, trunks and branches; in some fruits such as apples and pears, they can be found as small black dots. In trunks they are like freckles or white stripes. Another difference from stomas is that they do not open or close: their oval opening allows the exchange of gases by direct diffusion in cells.

Do the following activity to compare how different organisms breathe.

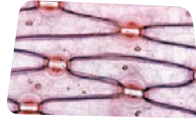


FIG. 3.11 Stomata are pores on a plant leaf that allow CO₂ to enter.

SESSION INFORMATION

Week: 20

Sessions: 119, 120

Expected learning outcome: Identify some adaptations of living things, from a comparative respiration associated structures analysis.

In the Lab

Nature's diverse ways to solve one problem.

Materials:

- Fish head.
- Magnifying glass (fig. 3.12).
- Petri dish.
- Latex gloves.
- Mouth cover.

Procedure:

1. Place the fish head over the Petri dish.
2. Carefully remove the gill protective cover.
3. Separate one or two gills and study them with a magnifying glass or microscope. Do not forget to use a robe and protective equipment (gloves, mouth cover).
4. Make a drawing to illustrate your observations.

	Breathing type	Observed Structure	Function
Fish			

Use the following questions to help you write your conclusions:

- What shape do gills have?
- What color are gills? Why are they that color?
- What type of breathing did you study?
- What is your conclusion from the exercise?

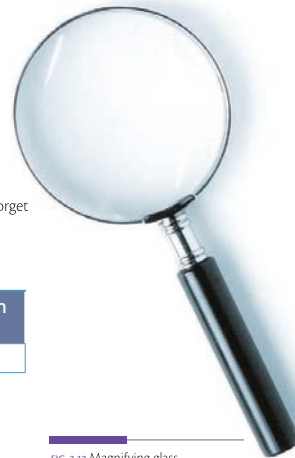


FIG. 3.12 Magnifying glass.

CONTENT DELIVERY

Start: Ask students to show the animal or plant they got. Ask them to find the structure to breathe.

Development: Students should do the experiment and explain their findings.

Closing: Students should answer to the questions on page 69, in the end of the page.

Project preparation: Students should read and do research on weather changes associated with human activities. Set four-member teams. Segment the information, they should give a presentation that includes: Information on the book, further research on the topic they should present and a questionnaire of 5 items.

SKILLS DEVELOPMENT

Logical/Mathematical Skills:

Experimenting.

Critical thinking skills: Analyzing, observing, comparing and contrasting.

Metacognitive skills: Planning and organizing.

EVALUATION OF CONTENT

Students should hand-in their answers to the questions and the chart should be complete.

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 21

Sessions: 121, 122

Expected learning

outcome: Explain some causes of the greenhouse effect, global warming and climate change as well as their impact on ecosystems, biodiversity and quality of life.

CONTENT DELIVERY

Start: Ask students to remember how hot has the school year been so far. Have them remember if the weather has been the same or different.

Development: Students should give their presentations. Help accordingly.

Closing: Once each team ends, they should ask their questionnaire to their partners. When they finish, they should self-monitor and self-correct their presentations.

→ Expected Learning

Explain some causes of the greenhouse effect, global warming and climate change and their impact on ecosystems, biodiversity and quality of life.

Analyzing Weather Changes Associated with Human Activities and their Consequences

When the balance is broken

Atmosphere is the layer of gases that covers Earth and consists of several sublayers. In Figure 3.13 you can see that the layer closer to the surface is the troposphere, this is where life develops and the only layer that has air. All air gases must be in equilibrium, so that the oxygen consumed during breathing, fires, etc. is the same as when photosynthesis is produced. However, when the balance is broken, some gases gather in the air and others become scarce.

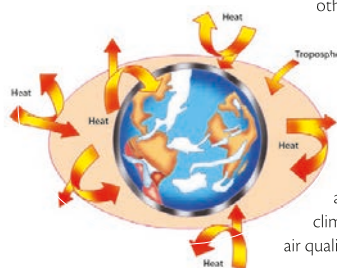


FIG. 3.13 The greenhouse effect traps thermal radiation in the atmosphere which raises the average temperature; this is due to the presence of gases such as carbon dioxide.

Advances in technology and population growth which demands more services, have upset the natural balance in different ecosystems.

Since the Industrial Revolution, emission of pollutants into the atmosphere has increased; this has led to higher concentrations of harmful substances in the air. As we learned at the beginning of the unit, the increase in pollutants also generates respiratory infections which may even lead to death and global climate change. Table 3.8 presents the most common air pollutants that cause poor air quality.

Table 3.8

POLLUTANT	MEANING	ORIGIN	HEALTH EFFECTS
Particles or aerosol	Solid or liquid substances in the air	Powder coming from the soil. Smoke from burning coal or gasoline.	They get into the respiratory tract causing infections.
Sulfur Oxide	It is a colorless gas, with a spicy and irritating odor.	The burning of any substance that contains sulfur.	Irritates respiratory tract. Reacts quickly with water causing acid rain with sulfuric acid.
Nitrogen Oxide	It is a toxic, colorless, odorless gas, that does not burn.	Nitrogen from the air when there is a fire.	Irritates respiratory tract. Reacts quickly with water causing acid rain with nitric acid.
Ozone	It is a colorless gas, with a spicy odor, which can be distinguished when there is a short circuit.	The action of sunlight against the nitrogen oxide.	Irritates respiratory tract and the skin.
Carbon Monoxide	It is one of the most abundant pollutants in the air, specially in large cities. It is a colorless, odorless and flavorless, and poisonous gas. One of the six major air pollutants.	Incomplete burning of fuels.	It competes with oxygen and mixes with hemoglobin. It makes people sleepy and causes death by suffocation.
Carbon Dioxide	It is the second most abundant greenhouse gas in the air, specially in large cities. It is a colorless, odorless and flavorless gas.	Breathing and the burning of organic matter.	Its accumulation in the air is a factor in the modification of Earth's climate.

Created with data from various sources, mainly Molina L, and M. Molina, 2005.

Kells

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SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring and self correcting.

Critical thinking skills: Defining concepts, formulating questions.

EVALUATION OF CONTENT

Students should mind map how mankind is altering the weather. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 21

Session: 123

Expected learning

outcome: Explain some causes of the greenhouse effect, global warming and climate change as well as their impact on ecosystems, biodiversity and quality of life.

CONTENT DELIVERY

Start: Ask students to remember how hot has the school year been so far. Have them remember if the weather has been the same or different.

Development: Students should give their presentations. Help accordingly.

Closing: Once each team ends, they should ask their questionnaire to their partners. When they finish, they should self-monitor and self-correct their presentations.

Homework: The following class students should do an experiment. Have them read the page 72 and agree in teams what each person should take.

Carbon dioxide, water vapor and other gases allow incoming light rays, but most reflect sunlight towards space; sunlight that reaches the planet's surface is turned into heat. Heat tends to increase and then if there is nothing to stop it, it escapes from the atmosphere. However, carbon dioxide and water vapor, among other gases, return heat back towards the Earth's surface, they are known as greenhouse gases (GHG).

The greenhouse effect is natural and the reason there are adequate conditions for life to develop on Earth. Human activities have disrupted the balance between the production of carbon dioxide and its absorption by plants. Increased use of internal combustion engines, the increasing rise of technology and use of petroleum fuels has resulted in the growth of carbon dioxide emissions that plants cannot absorb (Fig. 3.14).

In addition, deforestation, carried out by excessive logging, and oil spills in the oceans have reduced photosynthetic activity. Thus, the production of carbon dioxide has increased and its consumption has decreased. The increase of this greenhouse gas is one of the reasons that less heat escapes the atmosphere and, therefore, a greater amount remains near the surface, with a consequent increase in the planet's temperature. This phenomenon is known as global warming.

Global warming can be seen in climate changes, the melting of the polar icecaps, a rise in bodies of water like oceans and rivers, as well as an increase in hurricanes, desertification and droughts (Fig. 3.15).

In 2006, the Intergovernmental Panel on Climate Change, made up of scientific experts determined that human influence has caused changes in the average temperature of Earth's surface, which has increased by 0.6 °C over the past 100 years. In this period 1998 was the warmest year and the 1990s were the warmest decade.



FIG. 3.14 Mexico City has air pollution due high levels of carbon dioxide emissions.

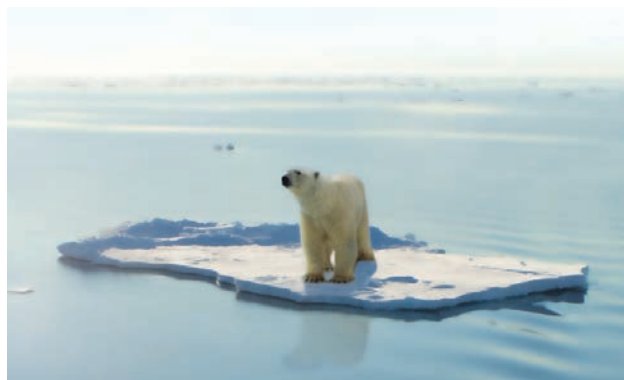


FIG. 3.15 Polar ice caps have melted due to climate change.

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SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring and self correcting.

Critical thinking skills: Defining concepts, formulating questions.

EVALUATION OF CONTENT

Students should mind map how mankind is altering the weather. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 21

Sessions: 124, 125

Expected learning

outcome: Explain some causes of the greenhouse effect, global warming and climate change as well as their impact on ecosystems, biodiversity and quality of life.

CONTENT DELIVERY

Start: Students should explain how they understand global warming happens.

Development: In teams, they should do the experiment. Help accordingly.

Closing: Students should answer the questions in the end of the experiment.

→ HANDS ON

In this activity you will understand better how the greenhouse effect occurs. Work in teams. Remember to use lab equipment to prevent accidents.

Materials:

- Two laboratory thermometers.
- A glass jar with a tight fitting lid and a straw hole (see picture).
- Another glass jar, preferably the same as above but without a lid.

Hypothesis:

In your notebook answer the following questions: How fast will temperature rise in a closed area? How much will air temperature increase in a closed glass jar? How much will it increase in an open jar?

Procedure:

Inside the classroom

1. Place one of the thermometers in the jar with no lid.
2. Place the lid on the other jar and insert the thermometer into the straw hole making sure the mercury bulbs of both thermometers are inside the glasses (Fig. 3.16).
3. Measure the air temperature in each vessel.

Outside the classroom

1. Place both cups in the sun, be careful not to place them in the shade.
2. Measure the temperature of both glasses every five minutes, record the results in a table. Draw a graph.

As a team, answer the following questions in your notebook.

- Which of the jars has a higher air temperature? Why was that?
- What is the difference in temperature between the jars?
- What was the highest reading? Why?
- Why was a jar uncovered? Compare your answers listed at the beginning of this activity.
- What is the relationship between the experiment and global warming?
- Which gas or gases is/are the jars representing?



FIG. 3.16 Both jars have a thermometer, one jar is covered to simulate a closed "atmosphere", and the other one is not.

Kells

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SKILLS DEVELOPMENT

Interpersonal skills: Working as a team member.

Critical thinking skills: Analyzing, Observing, predicting, developing hypothesis.

EVALUATION OF CONTENT

Students should present the experiment and analysis. The questions should be written in an essay format. That is, with the hypothesis, development and conclusion. Follow the Teacher's Guide projects rubrics on page 132.

Kells

Planning and Designing Desirable Environmental Scenarios

In the last 20 years a lot of evidence has been gathered about dangerous changes in the worldwide climate that the human race has decided to act upon. In response to global warming there are international, national, and individual actions.

The United Nations Organization has promoted the Framework Convention on Climate Change, which proposes that all countries commit to the reduction of the emission of greenhouse gases and stop the destruction of forests.

The UNAM, the INE, the SEMARNAT and other institutions take actions and publish studies like the National Strategy for Climate Change, created in 2007, that help us comply with international agreements to reduce our emissions, preserving and increasing green zones and restricting unnecessary burning of fuel. With actions like changing incandescent lighting for energy-saving bulbs, by creating wind and solar energy, and reforestation and protecting surface vegetation, our country is facing the climate change by promoting scenarios that involve everyone.

Biodiversity is essential for people to have a high quality of life, that is why we have to do things that will help us to get used to a changing climate and reduce our vulnerability to negative climate variations. We need to increase our abilities in preventing climate disasters and act appropriately.

As individuals, we can change some of our customs and habits by decreasing the consumption of energy, which does not mean stop doing what we like, but doing it in a more environmentally friendly and conscious manner.

At home we use light bulbs, televisions, refrigerators, washing machines, and many other electrical appliances. We cannot avoid using them but we can use them less: turn off the lights if nobody is in the room, unplug the television, the DVD, the stereo, and all the appliances that are turned on by means of a remote control because even if they are not being used, they consume energy.

We can also do something against gas consumption, we can take a five minute shower or less to save and not use too much hot water. The same should be done when washing dishes and clothes.

Use the car as little as possible, try to walk more and use public transportation, it is also a good idea to come to an agreement with other families to share the car and avoid only one person using a car as much as possible.

These are just a few of the many things that you can do to help our country meet its international commitments. We are also helping future generations to enjoy clean and healthy air as well as contributing to a better quality of life for all living things on the planet.

→ Expected Learning

Propose options to mitigate the causes of climate change that allow the projection of desirable environmental scenarios.

SO FAR YOU HAVE LEARNED THAT...

- Breathing is something all living things need and that evolution has created different ways for the exchange of gas in different environments.
- There are organisms that use oxygen and others do not require it.
- The main cause of air pollution are human activities that affect the quality of air.
- The accumulation of carbon dioxide increases the greenhouse effect and promotes global warming.
- It is important to reforest, avoid excessive logging and reduce the production of carbon dioxide.

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SESSION INFORMATION

Week: 21

Session: 126

Expected learning outcome: Propose options to mitigate the causes of climate change that allow the protection of desirable environmental scenarios.

CONTENT DELIVERY

Start: Prepare some pictures in which students can see the effects of global warming. Have them analyze and name the problem. (For example, a polar bear in the middle of a broken glacier).

Development: Students should read page 73. Prepare a set of five to seven questions to respond them with the information they read. Have them exchange questionnaires to check their answers.

Closing: Students should propose three solutions to improve environmental scenarios.

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SKILLS DEVELOPMENT

Critical thinking skills: Analyzing, problem solving.

Reading skills: Scanning.

EVALUATION OF CONTENT

Check that they give solutions to specific problems.

SESSION INFORMATION

Week: 22

Session: 127

Expected learning

outcome: Discuss how advances in science and technology have allowed prevention and improvement of respiratory diseases and the increase of life expectancy.

CONTENT DELIVERY

Start: Students should read the questions on the reflect box and answer them. Help them accordingly. Discuss it.

Development: Have them read the article *Thank you, Mr. Chimp*. Ask them to skim it and find the reason why the article has that name (it's in the end of the article). Discuss the topic in whole class. Then, have them create a story or narrate a story of a person who was really ill and how doctors, medicine or even surgery helped him out.

Closing: Make them see that science allows prevention and improvement in medical treatments.

Homework: Students should work in teams of four. They will interview four characters: Ian Fleming, Howard Walter Florey, Robert Koch and Wilhelm Rontgen. They should prepare questions and answers to each famous scientist. They should dress up. They will be on the TV show Kells Education.

Analyzing Technological Advances in the Treatment of Respiratory Diseases

→ Expected Learning

Discuss how advances in science and technology have allowed prevention and improvement of respiratory diseases and the increase of life expectancy.

Thank you Mr. Chimp.

James Hardy performed the first lung transplant in 1963. This is important only because it was the first attempt to replace the respiratory organs. This procedure has become common up to a point, more than a thousand per year are carried out today. The first transplant was a success that lasted only 18 days; but the death of the patient was not due to the surgery, but because of a kidney problem. And as in many other cases, the donor was a hero without knowing what he did for humanity's sake: it was a chimpanzee (Fig. 3.17).

In our country, it wasn't until 1989, when the first lung transplant was practiced at the National Institute of Respiratory Diseases.



FIG. 3.17 The first lung donor was a chimpanzee.

The next step was mastering the technique and having living donors, which required two or more **Reading** to donate a section (lobe) of their lung to make up an entire lung. Nowadays, we are moving towards the next step which is stem cell implant to aid the formation of new lungs inside a patient's body. These cells, taken from the embryonic stage, are able to become any tissue and therefore will bring about great progress in biomedical technology. In a few years, transplants, so useful and amazing, will be seen as very invasive procedures compared with the use of stem cells and, perhaps, even reduce the need for research on laboratory animals. Meanwhile, we must say: "Thank you, Mr. Chimp", because he offered his life, so that thousands of humans could live longer with lung transplants.

→ Reflect

- In what country do people live longer?
- Do you know how penicillin is connected to people who live longer?
- Do you know where penicillin is obtained?
- Many technological advances have increased life expectancy, do you think life is much better now than before? Why?

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SKILLS DEVELOPMENT

Reading skills: Skimming.

Verbal-linguistic skills: Creating a story.

EVALUATION OF CONTENT

Students should be able to narrate a story in which science helped out to cure a disease.

Figure 3.18 shows Alexander Fleming, an English researcher, who in 1928 discovered that the substance produced by a fungus was capable of killing microbes. This finding meant the beginning the era of **antibiotics**, which revolutionized medicine. Fleming was a bacteriologist, he worked with bacteria. To cultivate them, they need to be “planted” in glass containers called Petri dishes. If the cultivation is correct, only desired bacteria colonies will grow, but when a mistake occurs in the procedure, the cultivation is contaminated therefore different colonies of bacteria and fungi will grow.

A contaminated culture led Fleming to study the *Penicillium* fungus. He applied it to different kinds of microbes that caused diseases; and discovered that bacteria did not grow around the fungus. Ten years later, the Austrian medical research scientist Howard Walter Florey and the German biochemist Ernst Boris Chain, managed to separate the substance that had the power to kill bacteria.

In 1942, during WWII, Florey began to treat infections on soldiers wounded in battle with **penicillin**. The results were encouraging. Thereafter, the use of penicillin to treat infections that were once fatal, such as pneumonia, allowed many people to survive.

The use of penicillin particularly decreased the number of deaths by respiratory infections such as pneumonia, bronchitis, bronchopneumonia and associated complications of influenza.

Another important scientist was Robert Koch who discovered that every infectious disease is caused by different kinds of microbes. He identified the causative agent of tuberculosis, a bacterium in the form of a stick that is known as “Koch’s Bacillus” in his honor.

In 1895 Wilhelm Röntgen discovered x-rays, another important technological advance for medicine, particularly in the control of respiratory diseases. Chest x-rays are essential to detect early lung ailments, such as tuberculosis.

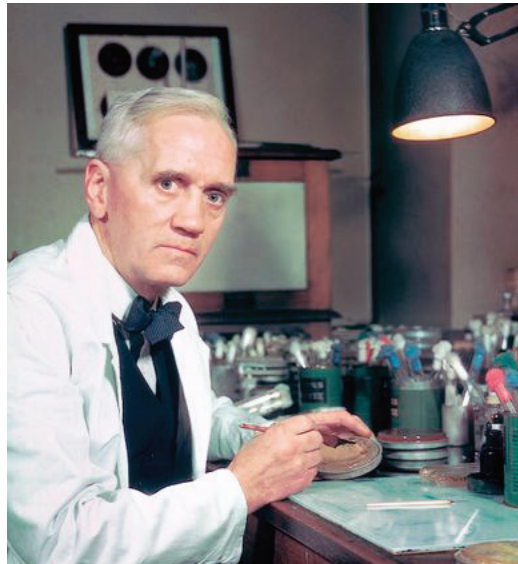


FIG. 3.18 Alexander Fleming
<http://www.biografiasyvidas.com/monografia/fleming/fotos3.htm>

GLOSSARY

Antibiotic. Greek anti (against) and bios (life), are those substances extracted from living things capable of killing microbes.

Penicillin. Substance with antibiotic, bactericide power extracted from fungi. Its name is due to its extraction from the *Penicillium* fungus.

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SESSION INFORMATION

Week: 22

Sessions: 128, 129

Expected learning outcome: Discuss how advances in science and technology have allowed prevention and improvement of respiratory diseases and the increase of life expectancy.

CONTENT DELIVERY

Start: Prepare a sign (or reuse) that reads Kells TV: Education. Take a microphone and Video recorder (made by students).

Development: Have them perform the interviews first in teams, and the best in whole class. Later, have them read pages 75, 76. Then, they should summarize the information.

Closing: Students should hand-in their summary.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information.

Bodily/Kinesthetic skills: Acting.

Critical thinking skills: Summarizing.

EVALUATION OF CONTENT

Students should be able to mention what each scientist did.

SESSION INFORMATION

Week: 22

Session: 130

Expected learning

outcome: Discuss how advances in science and technology have allowed prevention and improvement of respiratory diseases and the increase of life expectancy.

CONTENT DELIVERY

Start: Prepare a sign (or reuse) that reads Kells TV: Education. Take a microphone and Video recorder (made by students).

Development: Have them perform the interviews first in teams, and the best in whole class. Later, have them read pages 75, 76. Then, they should summarize the information.

Closing: Students should hand-in their summary.

Penicillin has led to many other amazing developments, such as the possibility of transplanting different organs, including lungs, used to improve the quality of life of people suffering from respiratory ailments. It is used as a last resource to cure serious illnesses.



FIG. 3.19 Home remedies are a reflection of our ancient culture.

In Mexico some people tend to use home remedies to address some diseases, as this is part of our ancient culture (Fig. 3.19). These remedies offer good results for some mild respiratory ailments, but if there is an infection, medical attention is necessary to restore health.

When a patient shows symptoms of an infection such as high fever, greenish or bloody phlegm, pain and redness of the throat, it is necessary to help the body with drugs prescribed by a doctor. A very common practice that should be avoided is self-medication; people frequently take medicine that friends or relatives recommend, sometimes without knowing the name of the medicine and without considering the risk.

Not all people react equally to the same drugs, simply because we are not the same; above all, the dosage is different based on age and weight, among other factors.

For example, some people are allergic to penicillin and when they are given a medication containing this substance, their body goes through symptoms of rejection that can lead to death. To avoid this risk, antibiotics are sold only with a doctor's prescription.

Another consequence of self-medication is taking the wrong antibiotics for a specific microbe, resulting in it not being exterminated and may even become more resistant to medication. Bacteria survive and can tolerate higher doses of antibiotics and they may also reproduce. This causes more serious relapses, so recovery will require higher doses.

Advances in medicine and technology have increased life expectancy, but also bring with them diverse consequences. One consequence is economic. With better health, people are more productive and contribute to the country's growth. But with longer lives, there are increases in the costs of elderly health care.

Do you remember that in the first topic of this unit, we learned that when getting older, smokers suffer chronic respiratory diseases? Diseases of longer recovery require therapy with longer stays in hospitals and more expensive drugs and technology.

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SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering information.

Bodily/Kinesthetic skills: Acting.

Critical thinking skills: Summarizing.

EVALUATION OF CONTENT

Students should be able to mention what each scientist did.

The Evolution of Microorganisms that cause Respiratory Diseases

It is clear that we will never finish fighting against infectious diseases of the respiratory system, since they are caused by microorganisms that reproduce very quickly (some bacteria divide every 20 minutes), and their evolution is faster than organisms with slower life cycles, like ours.

The current TB-causing bacteria (tuberculosis), for example, is different to the one that caused the disease 1,000 years ago. In fact, it is thought that the bacteria has evolved from another which attacks cattle. Similarly, flu is not caused by one kind of virus, but by an entire family of which more than 100 varieties are known and which continue evolving towards unexpected shapes.

This is how we know about new respiratory diseases that affect the world population continuously. Recent examples are bird flu and the severe acute respiratory syndrome (SARS).

SARS is an atypical pneumonia that has claimed the lives of about 1,000 people in 30 countries, so it is considered a supranational epidemic. According to the World Health Organization, this infectious disease is caused by a new kind of virus. Treatments include various antibiotics and antiviral agents that attack pneumonia.

The fact that nations are more interconnected than ever by transportation, favored the rapid transmission of this ailment. By traveling from one country to another, infected people transmitted it in different places, making it the first severe and easily transmittable disease that has struck human society globally. Meanwhile, communication technology, especially websites, helped spread the word about the problem faster and the alert was disseminated rapidly, giving countries - such as Mexico - time to establish measures to prevent the disease from reaching its people.

In 2009 the world went through H1N1, or Swine Flu, an influenza epidemic that took the lives of many people. Mexico's reaction was fast, classes were suspended in schools and public places, like cinemas and restaurants were shut down. Other measures were: limited human contact, using masks and disinfection of hands with alcohol-based gel. According to data from the Ministry of Health, were 72,548. 1,316 deaths occurred in our country, which were fewer than expected.

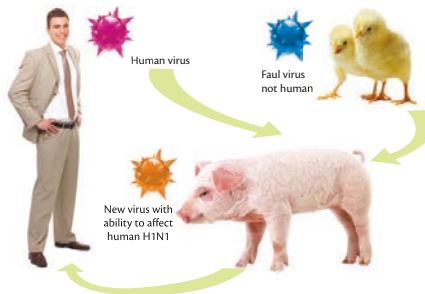
The virus spread quickly around the world and it seemed to show higher mortality rates in México (1.9 % us 0.14 %). Since it is a relatively new virus, most people have no immunity against it, and as long as it continues spreading, it is expected that more cases, more hospitalizations and more deaths will occur. Therefore, we must adopt hygienic measures to avoid getting infected (Fig. 3.20).

Source: <http://bvs.insp.mx/rsp/articulos/articulo.php?id=002371>

Expected Learning

Recognize that research on treatment of some respiratory diseases is permanently updated.

FIG. 3.20 It is very important to continue with hygiene measures to reduce the possibility of the H1N1 virus transmission.



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SESSION INFORMATION

Week: 22

Session: 131

Expected learning

outcome: Recognize that research on treatment of some respiratory diseases is permanently updated.

CONTENT DELIVERY

Start: Students should lead a poll to find out how often they get the flu or cold. Then, they will make a graph on their notebook to compile the results of all the class.

Development: Students will read pages 77 and 78 finishing before the hands on box. Then, they will create 10 questions about the reading (individually). Later, they will exchange questions to respond them.

Closing: Students should answer to your comprehension-check questions.

SKILLS DEVELOPMENT

Logical/Mathematical skills: Analyzing data to make a graph.

Critical thinking skills: Formulating questions.

EVALUATION OF CONTENT

Students should answer to your comprehension-check questions.

SESSION INFORMATION

Week: 22

Session: 132

Expected learning

outcome: Recognize that research on treatment of some respiratory diseases is permanently updated.

CONTENT DELIVERY

Start: Organize students in teams of four members. They will debate on one of the four situations that you will find in the hands-on section.

Development: Students should be assigned different roles in which two people should be scientists and two shouldn't. They will discuss and reach an agreement.

Closing: Students should be able to take a decision on whether science favors or destroys health.

SO FAR YOU HAVE LEARNED THAT...

- The discovery of penicillin by Alexander Fleming and its implementation by Florey and Chain greatly decreased mortality from severe respiratory infections such as pneumonia.
- In addition to penicillin, other factors that have helped to double the life expectancy of the population in less than a century are hygiene, vaccines and improved diets.
- The work of researchers such as Pasteur and Koch has improved health conditions around the world.
- Technological advances have implications on the economic, environmental and social areas of the population.
- The fight against respiratory diseases has no end since the evolution of microorganisms generates the appearance of new diseases.
- It is important to count on scientific and technological research to help improve the quality of life of people and care for the environment.

Influenza is an acute respiratory disease caused by various viruses that infect the lungs, leading to severe respiratory illness such as pneumonia, which can be aggravated by a secondary bacterial infection.

Unlike the common cold, the influenza infection presents a high fever (more than 39° C), a strong headache and intense muscle pain, accompanied by a sore throat and cough, as well as fatigue and weakness.

New diseases are expected to appear, some of which will pass by unnoticed because their effects will not be serious, but others will cause epidemics and death.

Society should work together to get rid of ailments that afflict us today and of those that may come in the future.

Towards the Construction of a Responsible and

HANDS ON

Challenges and opportunities for health of the respiratory system.

With your teacher's help, organize a debate on some dilemmas posed by modern life technology, associated with breathing. You can consider the following topics:

- The use of automobiles and transportation systems that benefit society but also pollute the environment. Possible solutions.
- The exploitation of wood through technological advances makes faster extraction and processing for construction, furniture, paper, among other applications, it is necessary to meet the demand of the population, however, deforestation exacerbates global warming. What to do?
- Increase in life expectancy implies economic and social costs in the future.
- Living in big cities implies benefits in employment opportunities, education and quality of life, but the existence of poor quality of air that you breathe, increases the possibility of acquiring chronic diseases associated to pollution, such as asthma and allergies.

Assign a classmate as moderator. Write down your conclusions on the board. At the end, you can design a billboard or posters to communicate your findings to others. Make sure that the entire school can see your work.

Keep your findings because they will be useful for the project.

Kells

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SKILLS DEVELOPMENT

Speaking skills: Discussing.

Intrapersonal skills: Developing different opinions.

Verbal linguistic skills: Discussing.

EVALUATION OF CONTENT

Students should be able to defend their point of view.

Project

Involved Citizenship

1 To start

This is a social project which pursues the recognition of air problems that affect our respiratory health. Throughout the unit, we reviewed important topics such as the most frequent respiratory illnesses and pollution problems that affect our breathing. In this project you will obtain information from other students or inhabitants of the community. With this information, discuss the best solutions and put them into practice (Fig. 3.21).

2 Supported Decisions

To determine what will be researched, we propose the following questions:
Is the main problem related to the quality of air at home, at school, or in my neighborhood? How to solve it? What are the most frequent respiratory illnesses at school? How to prevent them?

Do not forget to use what you have learned in this unit, it can be useful. Remember how you are going to investigate in your school or community.



→ Expected Learning

- Show curiosity and interest while posing problematic situations that favor integration of content studied in the unit.
- Analyze obtained information from different media and choose the most important to answer their questions.
- Organize data in charts derived from their questions.
- Describe their project results using different media (texts, graphic organizers, patterns) to support their ideas and share conclusions.

FIG. 3.21 In this unit we reviewed breathing related topics.

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SESSION INFORMATION

Week: 23

Sessions: 133 - 135

Expected learning outcome: Apply the unit content to develop a project.

CONTENT DELIVERY

Students should read the project and agree on how it should be presented, During the project presentations. Follow the Teacher's Guide projects rubrics on page 132.

SKILLS DEVELOPMENT

Reading skills: Scanning.

Critical thinking skills: Formulating questions.

Listening skills: Understanding information, self-monitoring, self evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 23

Sessions: 136 - 138

Expected learning

outcome: Apply the unit content to develop a project.

CONTENT DELIVERY

Students should read the project and agree on how it should be presented, During the project presentations. Follow the Teacher's Guide projects rubrics on page 132.

Consider the following:

- What do you want to know?
- How can you formulate questions to have rapid access to information?
- How can you make sure most people at your school, neighborhood and district are being surveyed?
- How many surveys should you do and when?

3 Perform

Do the activities according to your plan. Once you have applied the questionnaires, you will have to organize and present the information. Remember that you already know how to make data charts, to add the answers and obtain percentages, but now we encourage you to use your imagination and creativity so your results and conclusions are easier to understand. However, you must keep in mind that both your results and conclusions must be related to what you proposed to solve.

4 Share results

It is very important to share the results of your project. If you already know the way to reduce or solve the main problem about the quality of air in your community (Fig. 3.22), or the most frequent respiratory illnesses at your school, their causes and possible actions to prevent them, it is necessary to inform people about them, both inside your school community and out of it.

Creativity is important, the main goal is to get as many people as possible to hear your message, for instance, at a parents' meeting, civic ceremonies, elaborating and distributing printed material like flyers; through electronic presentations or videos on the web, among many others.

FIG. 3.22 Riding a bike instead of driving can help improve air quality in your community.



5 Evaluation

Take part in a general meeting to evaluate the development of the project. Ask yourselves if you could identify a problem and if the proposed solutions worked out.

Remember that you must evaluate the group, team and personal work. How could you improve the results? If you carried out a communication campaign, did it work satisfactorily? What was missing?

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SKILLS DEVELOPMENT

Reading skills: Scanning.

Critical thinking skills: Formulating questions.

Listening skills: Understanding information, self-monitoring, self evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Evaluation

Look at the image that represents Joseph Priestley's investigation (Fig. 3.23), in which he placed a mouse inside a glass bell and discovered it died after some time.



FIG. 3.23 Priestley's experiment.

- If we analyzed the air inside the flask after the mouse died, we would find that the proportion of oxygen would be:
 - 21% less than normal air.
 - Same as normal air.
 - Between 21 and 25% less than normal air.
 - There would be no air inside the flask.
- Following the analysis of the air inside the flask after the mouse died in Priestley's experiment, the amount of carbon dioxide (CO₂) would be:
 - Less than the percentage normal air has.
 - Same as the one normal air has.
 - More than the percentage normal air has.
 - We would expect not to find carbon dioxide (CO₂) in the air inside the flask.
- A TV program suggested not having plants inside the bedroom. Based on this statement point out if the reasons below are scientific or not.

REASON	IS IT SCIENTIFIC?
Because plants absorb oxygen when they breathe and compete with people.	Yes / No
According to Feng Shui, plants alter a bedroom's harmony.	Yes / No

Read the following tale:

Once upon a time, there was a teacher who asked a student:

- What is most important to you?
- To learn, professor, to become a Buddhist.

So, the professor took the student to the river and held his head underwater. When the professor lifted his student's head, the student was able to breathe deeply.

The professor asked him again:

- What is most important to you?

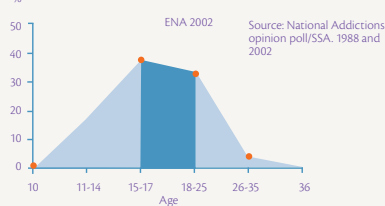
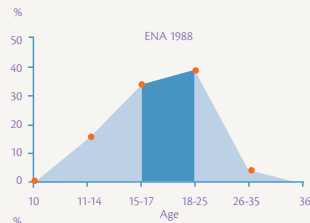
And the student answered:

- To breathe, professor, breathe.

- Why couldn't the student breathe under water?
 - Because there is no oxygen and even though we have breathing structures without oxygen there is no breathing.
 - Because human beings do not have the breathing structures necessary to inhale oxygen in water.
 - Because he held his breath and if he wanted, he could have breathed like fish do.

You will find two charts about the age in which Mexicans start smoking, according to national addictions opinion polls.

Distribution of smokers starting age (Mexico, 1988 and 2002)



Source: National Addictions opinion poll/SSA, 1988 and 2002

SESSION INFORMATION

Week: 24

Sessions: 139 - 141

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 81 and 82 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 122 to 123 along with the answer key, page 124.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

SESSION INFORMATION

Week: 24

Sessions: 142- 144

Expected learning outcome:

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 81 and 82 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 122 to 123 along with the answer key, page 124.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

5. Which age group had more people begin to smoke in 1988?:

- a) From 11 to 14 years.
- b) From 15 to 17 years.
- c) From 18 to 25 years.
- d) From 26 to 35 years.

6. Which age group had more people begin to smoke in 2002?:

- a) From 11 to 14 years.
- b) From 15 to 17 years.
- c) From 18 to 25 years.
- d) From 26 to 35 years.

7. The comparison between both charts indicates:

- a) There is no change in the starting age for smoking in Mexicans.
- b) Mexicans start smoking at younger ages than before.
- c) Mexicans start smoking at older ages than before.
- d) It is not possible to compare the graphs.

8. All the above can be explained because:

- a) Cigarette ads target teenagers.
- b) There is a strong influence from friends.
- c) In the ads, successful teens with money, handsome and extroverted are shown, co-relating the use of tobacco with beautiful things in life.
- d) All of the above.

9. Tobacco addiction has effects on our bodies, such as:

- a) Breathing illnesses and a bad quality of life.
- b) That people "seem to be more interesting" and improve their quality of life.
- c) Better respiratory health and high quality of life.
- d) High self-esteem and bad quality of life.

Daniel's mom told him the weather was unusual because she felt colder, and in those days the thermometer showed an unusually low temperature in her region. However, his grandmother mentioned that in the last century, in the 1960's, there had been a huge snowstorm, so that proved that drop in temperature was not unusual.

10. Based on what Daniel learned in Junior High classes, he commented that:

- e) His mother was right, because the climatic change can be seen in low local temperature and her perception is scientifically true based on what the thermometer shows.
- f) His mother is wrong. Because climatic change can be seen in the planet warming and not cooling. The thermometer is not valid.
- g) His mother is right. Because climatic change can be seen in the increase or decrease of temperature and the thermometer reading makes it scientifically valid.
- h) His mother is wrong. Because she refers to the temperature not to the climate, besides her perception is not scientific.



Reproduction and the Continuation of Life

Skills

- Natural processes and comprehension of phenomena, from the scientific perspective.
- Informed decision making for the promotion of environmental care and health oriented towards a culture of prevention.
- Comprehension of the scope and limitations in the development of science and technology in a number of contexts.

Expected Learning

- Explain how sexuality is a cultural construction, expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.
- Discriminations, beliefs and misconceptions associated with sexuality based on scientific arguments.
- Explain the importance of making responsible and informed decisions to prevent the most common sexually transmitted infections, including Human Papilloma Virus (HPV), and Human Immunodeficiency Virus (HIV), considering their causative agents and main symptoms.
- Provide arguments on the benefits and risks using chemical, mechanical and natural birth control, and the importance of deciding in a free and responsible way the number of children you want. Preventing adolescent pregnancy as reproductive health.
- Provide arguments on the importance of the interaction of living things and their relation with the environment and the development of diverse adaptations related to reproduction.
- Explain basic similarities and differences between asexual and sexual reproduction.
- Identify the participation of chromosomes in the transmission of biological characteristics.
- Recognize that scientific and technological knowledge associated with genetic manipulation are continuously updated, and it depends on society how it evolves.
- Identify different routes to solve the stated problematic situation.
- Do research using different sources of information to gather documentary evidence for the topics of the chosen project.
- Determine the scientific, political, economical or ethical components in the topic of the project.
- Use different media to communicate the project's results.

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SESSION INFORMATION

Week: 25

Session: 145

Expected learning outcome: Identify the unit main topic, grading criteria and final project.

CONTENT DELIVERY

Start: Ask students to read the title of the unit. They should draw something that represents the title. Explain to students the grading criteria, projects requirements, and expected learning outcomes of the unit. Students need to know the dates when the last project should be presented as well.

Development: Form teams of four people. It's important that you form the teams to guarantee no one is excluded. Explain the first project presentation: Form groups of four people; Segment the information on pages 85 – 87 (Suggestion: Gender and hands on section on page 85, Affective bonds and eroticism on page 86, reproduction and research on page 87). They should present the information on the book besides any extra information; they should prepare visuals, a mind-map with the information they were assigned and five questions about their information.

Closing: Students should explain to the teacher who is doing each activity in the project.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing study material.

EVALUATION OF CONTENT

Students should explain to you who is going to do what in the project of the unit..

SESSION INFORMATION

Week: 25

Sessions: 146, 147

Expected learning outcome: Explain how sexuality is a cultural construction, and is expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.

CONTENT DELIVERY

Start: Have students open their books to page 84, read the reflect box and answer the questions in whole class.

Development: Students should give their presentations (help accordingly); ask their questions, self-monitor and self evaluate their performance.

Closing: Students should ask their questions to their partners.

→ Expected Learning

Explain how sexuality is a cultural construction, and is expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.

Recognizing the Importance of Sexuality as a Cultural Construction and its Potential in the Different Stages of Human Development

Reading

Other countries, other cultures, other customs.

Maria is a 13 year-old girl who had to travel to Norway due to her father's job. She sent an e-mail to Juana, her best friend in Mexico, and told her all she knows about that country, including family relationships. To her, it is not new that, for example, there is a neighbor of the same age that lives only with her mother because her parents are divorced. But one of her classmates, Elizabeth, is taken care of by her father while her mother, an opera singer, tours several countries. For Maria, fathers are the ones who travel and mothers the ones who stay home to take care of children. Or, as in her own case, the whole family travels.

Another new thing Maria discovered, is that relationships between people

and the activities they do are exercised with more freedom than in her country.



FIG. 4.1 In all cultures, the first affectional bonds are with one's family.

→ Reflect

Answer these questions in your notebook:

- Do you know other cultures where family relations are different from yours? (Fig. 4.1)
- Who takes care of the children in your family most of the time?
- Do you know someone devoted to the arts (painting, music, sculpture, theater)? Is it a man or a woman?
- Does being a man or woman influence job performance? Why?

Share your answers with your classmates.

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SKILLS DEVELOPMENT

Metacognitive skills: Self-monitor, self-evaluate.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Ask your own comprehension check questions on each topic. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 25

Session: 148

Expected learning outcome: Explain how sexuality is a cultural construction, and is expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.

We know that sexuality takes a fundamental role in the biological function of reproduction. In that sense, we are similar to all animals that have sexual reproduction, but human sexuality is much more complex, since we also express our sexuality to relate to others, establish affection, recognize each other as individuals, integrate our personality, create, give and receive pleasure. Most of the time, we do it through non instinctive, but learned conducts. For those reasons, we can say that sexuality and gender are a cultural manifestation of individuals in the society they live (Fig. 4.2).



FIG. 4.2 Gender and sexuality are related to our cultures.

Gender

It is a common practice to use gender and sex as synonyms, however, they do not mean the same. Sex is a biological characteristic which includes all anatomical and physiological manifestations that make us different as men and women. Gender is something much more complex; nowadays gender refers to a set of ideas, manifestations, beliefs, representations and social attributions built in every culture, based on sexual differences.

It is expected that women and men behave within the patterns or **stereotypes** marked by customs, a certain way of dressing and particular activities.

Men and women are different, but that does not mean that one gender is more capable than the other, when they have a certain profession or hold a social position or role. Freedom of gender means that all, men and women, have equal conditions for being accomplished as individuals; deciding how to behave, dress, relate to others and what to do for a living, without anybody preventing us for doing something because society considers that it is not appropriate or convenient for our gender (Fig. 4.3).

GLOSSARY
Stereotype. Image or idea commonly accepted by a group or society, regardless of its veracity.

The free exercise of sexuality, regarding gender, also refers to granting women and men rights to decide on their sex life, for example, when and with whom to start it, when and how many children to have, what birth control and sex protection against STDs (Sexually Transmitted Diseases) to use, among others.



FIG. 4.3 Many times gender roles are cultural attitudes, but men and women have the same skills to perform all the activities we are interested in.

→ HANDS ON

Work in pairs and write your answers in your notebook.

- What are some gender stereotypes found in your community.
- Do you think these stereotypes should change? Why?

Discuss your answers with the rest of your classmates and write your conclusions in your notebooks.

Kells

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CONTENT DELIVERY

Start: Have students answer a couple of questions about the previous presentations.

Development: Students should give their presentations (help accordingly); ask their questions, self-monitor and self evaluate their performance.

Closing: Students should ask their questions to their partners.

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Ask your own comprehension check questions on each topic. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 25

Session: 149

Expected learning

outcome: Explain how sexuality is a cultural construction, and is expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.

CONTENT DELIVERY

Start: Have students answer a couple of questions about the previous presentations.

Development: Students should give their presentations (help accordingly); ask their questions, self-monitor and self evaluate their performance.

Closing: Students should ask their questions to their partners.

Affective bonds

Sometimes is hard to understand that just like other social species, we need others to survive, no matter how strong, smart, healthy or skilled we are. In fact, we are the species that needs more care at birth. Thus, within social groups, conducts such as help, protection and care for survival of another living creature appear, and as part of those conducts, "feelings" like affection and love are expressed.

FIG. 4.4 Caring for others leads to feelings of love and affection.



Bonds develop due to the human ability to relate to others and respond to the actions of others. Hence, in our interaction with other people we develop thoughts and emotions that lead us to establish tight and intense relationships (Fig. 4.4). Love is probably the most known affective bond. There are several different manifestations and demonstrations of love; to our parents, our family, our friends, our partner and to ourselves.

From a social perspective, humans learn to create affective bonds in their families, to experience and reinforce them with friends and colleagues. It is in these relationships that we learn to know and recognize ourselves as members of one group and to help each other. We express our closeness to someone by the way we talk to them, by the tone we use and even by the way we move.

Eroticism

Eroticism, refers to the physical pleasure experienced through the senses, and it is related to sexuality or to sexual desire. Eroticism can be experienced through new sensations that provide us with pleasure. Sexual pleasure must be assumed without guilt or shame, in order to enjoy physical, mental and emotional health.

Eroticism is related to sexual pleasure, since it results from stimuli we receive through our senses, such as when someone we like, establishes physical contact with us.



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Kells

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Ask your own comprehension check questions on each topic. Follow the Teacher's Guide projects rubrics on page 132.

Reproduction

Reproduction is a fundamental feature in all living creatures, that allows us to generate new individuals. In the case of human beings, reproduction is a very important part of our sexuality. Unlike other organisms, like some mammals, that reach their sexual maturity when they are one year old and can reproduce, we have to grow and go through our whole childhood, that is 10 or 12 years, before experiencing any changes in our bodies and our sexual organs to begin their reproductive functions (Fig. 4.5).

Reproduction in human beings may occur when sexual intercourse between a man and a woman takes place. During this intercourse, known as coitus, the man's penis is inserted into the woman's vagina; if ejaculation happens and the woman is in her ovulation period, it is very likely that some of the spermatozooids find the ovum or egg and manage to penetrate it, this is known as fertilization. A zygote forms once fertilization takes place. fertilized cell moves slowly to the uterus, where it implants itself and becomes an embryo. This embryo will develop into a fetus and rest there for approximately 40 weeks. This period is known as pregnancy, and its end is known as delivery or birth of the new human being.

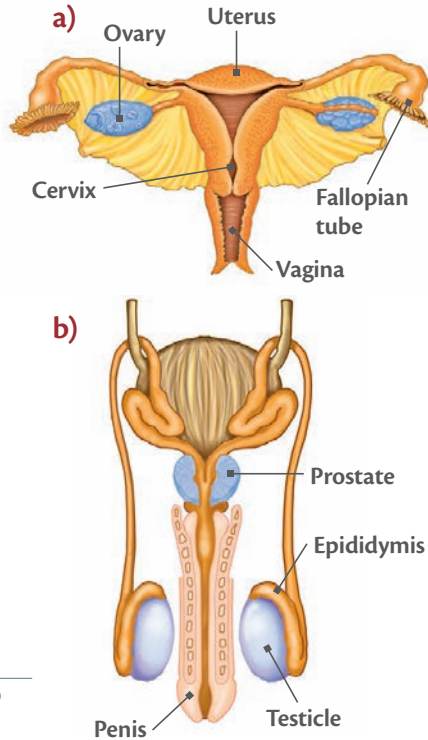


FIG. 4.5 Reproductive system: a) Female and b) Male.

Research

1. In teams, investigate the function of the feminine and masculine reproductive organs.
2. Answer the following questions in your notebook with the information you obtained:
 - a) What happens after the fertilization of the ovum?
 - b) Which are the stages of the zygote?
 - c) Where does the gestation of the fetus occur?
 - d) Why is it important to know when ovulation takes place?
3. Discuss your answers with your classmates and teacher.

Kells

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SESSION INFORMATION

Week: 25

Session: 150

Expected learning outcome:

Explain how sexuality is a cultural construction, and is expressed throughout our whole lives, in terms of affectionate links, gender, eroticism, and reproduction.

CONTENT DELIVERY

Start: Have students answer a couple of questions about the previous presentations.

Development: Students should give their presentations (help accordingly); ask their questions, self-monitor and self evaluate their performance.

Closing: Students should ask their questions to their partners.

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Ask your own comprehension check questions on each topic. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 26

Session: 151

Expected learning

outcome: Discriminate, based on scientific arguments, beliefs and misconceptions associated with sexuality.

CONTENT DELIVERY

Start: Have students read the introduction to the sequence and the hands on box.

Development: Discuss in whole class the definition of myth asking them for examples of myths. Then, have them discuss the different myths mentioned in the hands on box to determine whether they are true or false.

Closing: They should do research on common myths. The instructions can be found on page 89. During the following 5 sessions, they will present their findings. Form teams of four people. The project should include all the requirements explained in the research box, questions to make to their partners, and visuals.

Identifying Common Myths Associated with Sexuality

→ Expected Learning

Discriminate, based on scientific arguments, beliefs and misconceptions associated with sexuality.

According to the Dictionary a myth is a “wonderful narration outside the historic time starring divine or heroic characters and it is often used to interpret the origin of the world or a bigger event of mankind”. The term “myth” also refers to a “person or thing to which qualifications or special characteristics that do not exist, are attributed”.

In the case of sexuality, myths can have multiple origins and sources since in many cultures sexuality is a prohibited subject or taboo (Fig. 4.6). According to the definition of myth, in sexuality, it is common to find beliefs that are not based on facts, but which may serve to explain some phenomena or social rules.

In other regions of the world, to ensure that female sexuality has only a reproductive purpose, women’s genitals are mutilated to “ensure” they do not have sex before marriage and to

→ HANDS ON

True or false?

There are many myths about sexuality, for example, when we are told that babies are brought by the stork or when we believe we can get pregnant by swimming in a pool. In teams of three or four, mention at least two myths about sexuality and discuss how you might prove these are misconceptions. When you are finished, share your conclusions with the rest of your classmates.

always be true or faithful to their husbands. The United Nations condemns these actions, since they threaten human rights, health and the lives of people who suffer them.

A way of living a full life with a healthy sexuality includes access to truthful and reliable information. Today’s teens have access to different media such as web videos, television, among others, which may provide suitable and



FIG. 4.6 In some societies women must cover their bodies for religious and cultural reasons.

Kells

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SKILLS DEVELOPMENT

Speaking skills: Discussing.

Metacognitive skills: Planning, organizing.

EVALUATION OF CONTENT

Students should be able to give reasons why they think the myth is true or false.

truthful information, but also distort it. Thus, in addition to cultural myths generated by the environment, electronic media create and spread new myths. What must we do to have adequate information about sexuality? (Fig. 4.7).

➔ Research

With your teacher's help, draw a graph of the myths that were discussed at the beginning of the topic and tell if these myths belong to a potential aspect of sexuality or if they belong to several.

In teams, divide the myths listed on the board and investigate the following: With what scientific argument can each myth be debated? You can use books from the library, from your classroom or school; you can also ask the school doctor or go to health centers; in addition an anthropologist, sociologist or ethnologist can help with your research.

Once you finish your research, complete your chart by writing under each myth, if you found its origin or explanation and in another row write the scientific argument that **refutes** the myth.

Finally, come to a conclusion and answer the following questions in your notebook:

- What must we do when we believe the information we have is uncertain?
- How can we identify or differentiate a myth from reality? What features does each one have?
- What are some reliable sources to obtain adequate information?
- How many sources should be consulted before concluding whether something is a myth or a reality?

GLOSSARY
Refute. To prove that something is false or erroneous.



FIG. 4.7 Healthy sexuality is important to leading a fulfilling life.

Kells

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SESSION INFORMATION

Week: 26

Sessions: 152 - 156

Expected learning outcome: Discriminate, based on scientific arguments, beliefs and misconceptions associated with sexuality.

CONTENT DELIVERY

Start: Show students pictures that depict myths related to sexuality around the world. Have them try to guess what the myth is. Help accordingly and tell them whether their guess is right or wrong.

Development: Students should give their presentation. Help accordingly. Once they finish, they should ask their partners the questions they prepared and later, they should self-monitor and self-correct their presentation.

Closing: Ask students at random your own comprehension-check questions. (Suggestion: You might want to use the questions in the end of the research box).

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Students should be able to respond to your comprehension-check questions. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 27

Session: 157

Expected learning

outcome: Explain the importance of making responsible and informed decisions to prevent the most common sexually transmitted infections, including human papilloma virus and HIV, considering their causative agents and main symptoms.

CONTENT DELIVERY

Start: Students should read page 90 and explain how much they know about sex and if it is important to be well informed about it.

Development: Students should give reasons why it is important to be responsible and well informed on sexuality.

Closing: Students will give presentations on: HIV, HPV, gonorrhea, and genital warts or condyloma acuminatum. Form teams of four people. They should include disease description, symptoms, preventive actions, visuals, and a questionnaire of five questions.

→ Expected Learning

Explain the importance of making responsible and informed decisions to prevent the most common sexually transmitted infections, including human papilloma virus and HIV, considering their causative agents and main symptoms.

The Social and Personal Implications of Sexual Diseases caused by HPV and HIV, and the Importance of Prevention as Part of Sexual Health

How much do we know about sex?

Sexuality is essential to our development as individuals. It is important to assume that it is a personal responsibility to take care of ourselves to have good physical and psychological health. The kind of human beings we become depends on this.

When sexual intercourse is practiced by mutual consent, it can provide us great pleasure. It should not be forgotten that a sexual relation also carries a great responsibility involving the reproductive, health and cultural aspects. Proper sexual education should provide information to people so they can make decisions to have a safe and protected sexuality without being exposed to health risks. Sex should be a personal decision made with all the necessary knowledge and information to practice it in a satisfactory way (Fig. 4.8).



FIG. 4.8 Sex is a personal decision and should be made with all the necessary knowledge.

Viruses HPV and HIV, a problem that concerns us all.

Viruses are entities composed of a portion of genetic material, either RNA or DNA that can enter our body and stay without being detected by our immune system or they can start a malignant reproduction that shows their presence. How we come into contact with a virus can vary. In most cases, the virus is detected and removed by the immune system which is our "guardian" against these kind of invasions.

Sometimes, however, the virus hides its genetic information in one of our cells and our immune system is not able to detect it. So, for some time nothing will happen, but the

Kells

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SKILLS DEVELOPMENT

Metacognitive skills: Planning and organizing.

Intrapersonal skills: Developing an opinion, introspecting.

EVALUATION OF CONTENT

Students should be able to give reasons why it is important to be responsible and well informed on sexuality.

presence of this strange material may disrupt the functions of our cells “giving incorrect orders” such as “stop working and start growing and reproducing”. If an altered cell divides uncontrollably, it can generate a large tumor formed by many cells that “behave badly” and degenerate into cancer. HPV is an infection that is transmitted to men and women who are sexually active, or through skin contact with infected mucous membranes (Fig. 4.9).

Therefore, HPV is not necessarily an indicator of having unsafe sexual practices, since its transmission does not require having sexual intercourse. In the case of HIV, the virus is hosted on T-lymphocytes, our immune system’s guardian cells. It begins to reproduce after a while and to kill the cells where it is hosted, leaving the person who carries it defenseless to infectious diseases.

Talking about the Human Immunodeficiency Virus (HIV or AIDS), INEGI reported cumulative historical data from 1983 to 2006, that shows that sexual transmission remains the main



FIG. 4.9 The best way to keep sexual health is through accurate information that clarifies doubts. A specialist will always give the best guidance.

SSA will apply universal vaccines against HPV in 2012

Reading

The Department of Health announces that this program will benefit girls from nine to twelve years old nationwide, will be benefited. Health authorities announced that as of the following year, they will begin to apply the Human Papilloma Virus (HPV) universally, to prevent cervical cancer (Fig. 4.10). The federal administration said in an interview, that before coming to the end of its term, the vaccine will benefit girls across the country.

They stated that the vaccination program will be expanded to universal immunization against the virus. The goal is to reduce cervical cancer which is the second leading cause of death among women in reproductive age. Despite the actions carried out to reduce this serious public health problem, an average of 4,000 deaths a year in women between the ages of 35 and 50 are still registered. Prevention programs have managed to move it to the second place of death incidences; the leading cause is breast cancer. So, the universal vaccination program against HPV will be carried out in health centers, at IMSS and ISSSTE, and applied in three doses within a year to protect girls in Mexico from the threat of cervical cancer.



FIG. 4.10 One way to detect early cervical cancer is by having a Pap test or Pap smear.

News has been modified and retrieved from: MEXICO city Tuesday, June 21, 2011 NTX El Universal

Kells

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SESSION INFORMATION

Week: 27

Sessions: 158 - 161

Expected learning outcome: Explain the importance of making responsible and informed decisions to prevent the most common sexually transmitted infections, including human papilloma virus and HIV, considering their causative agents and main symptoms.

CONTENT DELIVERY

Start: Prepare some information on the diseases to guide students. Ask students to listen to their partners and show respect since you will be discussing topics, which are usually a taboo in Mexican society.

Development: Students should give their presentations. Make sure everyone completes a chart that includes: disease name, description, symptoms, and preventive actions. Once students finish, they should ask their questions to their partners.

Closing: Ask your own comprehension check questions.

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Students should be able to respond both, to their classmates’ questions and yours. They should also hand-in their charts. Follow the Teacher’s Guide projects rubrics on page 132.

Kells

SESSION INFORMATION

Week: 27

Session: 162

Expected learning

outcome: Explain the importance of making responsible and informed decisions to prevent the most common sexually transmitted infections, including human papilloma virus and HIV, considering their causative agents and main symptoms.

CONTENT DELIVERY

Start: Ask students for two reasons why it is important to be informed about sexual infections at random.

Development: Students should read the reflect boxes and discuss their answers. Students should reach an agreement.

Closing: Wrap the topic up with a brief summary.

Homework: Students should take an egg and some paper to decorate it.

➔ Reflect

Answer after reading the news :

- Why do you think this vaccine is aimed only at girls and not boys?
- If you had daughters of that age, would you get them vaccinated? Yes? No? Why?
- If you have sisters in that age range, do you think your parents will take them to get vaccinated?

infection factor (96.2% in men, and 88.3% in women), followed by blood-borne (3.4% and 11.5% respectively). Notice that when new cases of AIDS were diagnosed, 15 year olds come into the range of adults. There are public institutions such as SSA, ISSSTE, and IMSS, which have the highest percentage of notifications and absorb the heaviest burdens in treatment of diseases.

➔ Reflect

In teams discuss the following points, share your answers and conclusions with the rest of your classmates. Then, draw one column on the board for similar answers, and another column with answers that were different. With your teacher's help write your conclusion.

- How can we prevent the spread of both viruses?
- Are there any cultural factors that hinder the prevention against infections?
- Are there health centers in your community that offer complete information about HPV, HIV and STDs in general? Which are those?

Kells

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SKILLS DEVELOPMENT

Interpersonal skills: Mediating.

Intrapersonal skills: Developing opinions.

Critical thinking skills: Analyzing.

EVALUATION OF CONTENT

Students should deliver their summary.

Reproductive Health: Comparing Contraceptive Methods and their Importance in Birth Control and Health

Full reproductive health requires information in order to enjoy sexuality without risks and being responsible to decide when and how many children to have. Before deciding to have a child, we must take into account the economic resources we have to offer him/her a good life that includes nurturing, education, health and amusement (Fig. 4.11).

Likewise, it is important to keep in mind that a human being also requires time and attention, education and affection. In order to raise a child, it is desirable to have the appropriate physical, economic and psychological conditions.

→ Expected Learning

Provide arguments on the benefits and risks of the use of chemical, mechanical and natural birth control, and the importance of deciding in a free and responsible way the number of children you want, and preventing adolescent pregnancy, as part of reproductive health.

→ Reflect

Having a child brings along numerous responsibilities in which family economics and extra efforts are involved. In order to explore the topic, work in pairs with a female or male classmate, and imagine you have to take care of a six month old baby for a month. The baby came to you with just one set of clothes, so you have to solve all the additional needs he or she has.
Hands on:

1. Prepare a list of products the baby needs. Go to the nearest supermarket and drugstore, and gather data about the cost of the products that you are going to need. Get informed by the school doctor or a family member, like your mother or grandmother, about a baby's essential needs, the number of times to feed, the type and amount of food needed, how to keep the baby clean and healthy, and any other information you consider appropriate.
2. Remember the baby will be with you for one month, so make an estimate of how much money you need to buy diapers, milk, bottles and other necessary things.
3. Now, add it all up and check what the total expenses of having the baby at home are.
4. Research what the minimum wage is where you live.
5. Compare the expenses involved in having a baby and estimate how many times the minimum wage you would need to buy everything you need.
6. Discuss what you would do if the baby cries, how you can know if the baby is sick, etc.
7. Reflect on what must be done to promote his/her development.
8. Ask some people you know and who have recently become parents, how their lives have changed: Can they sleep the same number of hours than before they were parents? Can they still go to the movies or do other kinds of activities as before?
9. Present the outcome of your research to the class.

One of the biggest problems associated with the lack of information about birth control methods (or to the incorrect interpretation) is pregnancy during the adolescent phase. It is normally an unplanned event which dramatically modifies the life plan and causes frustration because, in addition to giving up part of future projects, the boy or girl may have to face and deal with rejection from other people and sometimes from their own family.



FIG. 4.11 One of the main responsibilities we have as human beings is to think about the quality of life we will give our children.

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SESSION INFORMATION

Week: 28

Session: 163

Expected learning outcome: Provide arguments that support the benefits and risks of chemical, mechanical and natural birth control and the importance of deciding in a free and responsible way the number of children you want to prevent adolescent pregnancy, as part of reproductive health.

CONTENT DELIVERY

Start: Tell students that they will be parenting their egg for the rest of the unit. Therefore, they should name their egg, dress it, clean it and change its clothes regularly. You should make sure to sign the egg and write down its name in the bottom to guarantee it is the same egg.

Development: Ask students to read the reflect box and follow instructions in teams.

Closing: Teams should present their estimate.

Project preparation: Segment the information on pages 94 and 95 according to the number of teams you have. Students should give their presentations including: the name of the contraceptive method, effectiveness, cost, side effects, visuals, and a 5-item questionnaire.

SKILLS DEVELOPMENT

Humanistic skills: Caring for something.

Interpersonal skills: Mediating.

Critical thinking skills: Comparing and contrasting.

EVALUATION OF CONTENT

Students should bring their egg in the evaluation week to give them an extra point for having taken care of their egg.

SESSION INFORMATION

Week: 28

Sessions: 164 - 167

Expected learning outcome:

Provide arguments that support the benefits and risks of chemical, mechanical and natural birth control and the importance of deciding in a free and responsible way the number of children you want to prevent adolescent pregnancy, as part of reproductive health.

CONTENT DELIVERY

Start: Students should read and answer the questions in the Reflect box on page 94. Discuss in whole class.

Development:

Have them give their presentations. Help accordingly. Everyone should make a mind map including: The name of the contraceptive method, effectiveness, cost, and side effects. Once they finish, they should self-monitor and self-correct their presentations.

Closing: Students should hand-in their mind maps.



FIG. 4.12 Pregnancy during the teenage years is considered high risk.

discomforts of the infection, but she/he can also transmit the infection to other people through sexual contact or other means, such as the mother to the child during pregnancy, thus generating a disease chain which ends up becoming a social problem.

It is very common that adolescent pregnancy brings more problems to the woman than to the man, but it is very complicated for both to have to face the fact that they will become parents at a very early age, especially because they do not have the economic resources nor the maturity needed to cope with this responsibility.

It is very important that teenagers have appropriate and reliable information on how to manage their bodies and their sexuality in a safe and responsible way, and to know about different measures to prevent an unplanned pregnancy and STDs.

Another aspect of pregnancy in teenagers is the physical risk associated with this situation. Adolescent mothers are still in a growing process, and therefore their reproductive systems are not fully developed; their organism finds itself in a conflict related to the allocation of the body's resources. This can cause the mother to have nutrition problems such as anemia and loss of calcium in the bones. In addition, the baby's growth can be diminished and the risks of delivery increase noticeably.

Other risks, such as the baby suffering anemia, low weight at birth or congenital malformations also increase. Pregnancy during adolescence is considered high risk, because if no specific care is taken, maternal death can occur. It is important that if pregnancy happens during adolescence, the mother is treated by specialists and provided with health services (Fig. 4.12).

STDs and adolescence pregnancy are, not only personal problems, but also public health problems. In the case of STDs, the infected person not only suffers the

→ Reflect

In teams, answer the following questions and read them to the group. Write your conclusions on the board.

- How can adolescent pregnancy be prevented?
- How can we prevent STDs?

Kells

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SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

Critical thinking skills: Summarizing, formulating questions.

Interpersonal skills: Working as a team member.

EVALUATION OF CONTENT

Students should be able to answer to their partners' questions. They should hand-in their mind-maps. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 28

Session: 168

Expected learning outcome: Provide arguments that support the benefits and risks of chemical, mechanical and natural birth control and the importance of deciding in a free and responsible way the number of children you want to prevent adolescent pregnancy, as part of reproductive health.

CONTENT DELIVERY

Start: Prepare some questions to check students remember information related to birth control.

Development: They will write an article on reproductive health following the writing process: Prewriting, drafting, revising, proofreading and publishing. Write the question: How can you define reproductive health? Explain the writing process steps briefly and get them to work on their paper.

Closing: Students will deliver their article.

Birth control methods today.

The use of contraceptives is a way to make decisions about our reproduction (Fig. 4.13).

According to the Health Ministry, birth control methods are divided into the following categories:

Temporary

The user can decide when to stop using these and recover fertility.

- Oral hormone methods.
- Injection hormone methods.
- Post coitus hormone methods.
- Under skin hormone methods.
- Intra uterus devices.

- Barrier and spermicide methods.
- Natural and periodic abstinence methods.
- Breastfeeding and amenorrhea methods.

Permanent

These are definitive and fertility cannot be recovered.

- Bilateral tubal occlusion.
- Vasectomy.



FIG. 4.13 Condoms are a cheap and safe form of contraception.



SO FAR YOU HAVE LEARNED THAT...

- Human sexuality manifests itself four different ways: gender, affectionate bonds, eroticism and reproduction.
- At times, affectionate bonds, behavior and reproduction are influenced by social and family context.
- Gender differences do not influence physical and intellectual capability to perform activities and obtain equal opportunities.
- In sexuality exertion, personal and social implications exist.
- There are sexually transmitted infections caused by viruses, and we can prevent them.
- Some sexually transmitted diseases, put life at risk such as the papilloma virus and HIV.
- If we avoid risky or unprotected sexual practices, we protect ourselves.
- A sexually transmitted infection is not a reason to feel ashamed, although prevention is always better. If necessary, visit a doctor to get the most adequate treatment.
- The main birth control methods are temporary and permanent. Understand their function and effectiveness.
- Adolescent pregnancy represents risks, as well as social and psychological implications.
- Deciding to have children is a personal decision.

HANDS ON

To develop this activity you will have to expand your information regarding birth control methods. You can go to your nearest public health center and ask doctors and nurses, or ask your school doctor, or else, go to the school or classroom library.

Work in teams and choose a contraceptive method.

Do some research about it and prepare a presentation for the rest of your classmates. Include information such as effectiveness, cost, side effects, etc., as well as the advantages and disadvantages of this method.

Once all the teams finish their presentations, answer the following questions in your notebook.

- Why is it necessary to be informed about existing birth control methods?
- If you had to choose a birth control method, who would you ask for advice?
- What factors can influence for an informed adolescent to not use birth control methods?
- How could the previous question problem be solved?

Kells

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SKILLS DEVELOPMENT

Writing skills: Writing process.

EVALUATION OF CONTENT

Students should hand in their article.

SESSION INFORMATION

Week: 29

Session: 169

Expected learning outcome: Provide arguments on the importance of the interaction of living things and their relation with the environment as well as the development of diverse adaptations related to reproduction.

CONTENT DELIVERY

Start: Students should read about the Mexican sparrow and explain why the female rejects the male whose feathers turn yellow.

Development: Students should answer to the questions in the Reflect box. Help accordingly. They should draw a hypothesis, discuss and reach an agreement.

Closing: Students should bring for homework, images of their three favorite animals but showing a male and a female.

→ Expected Learning

Provide arguments on the importance of the interaction of living things and their relation with the environment and the development of diverse adaptations related to reproduction.

A Comparative Analysis of some Reproduction Adaptations in Living Things

Reading

What do living things need in order to reproduce in their environment?

The Mexican male sparrow, whose scientific name is *Carpodacus mexicanus* (Fig. 4.14), has attracted the attention of many researchers because its feather colors change. This would not seem anything exceptional in his life, but these changes affect his success with the opposite sex. As teenagers might say, he loses his "popularity with the girls". Actually, when the sparrow's red feathers turn yellow, this indicates it has parasites, is poorly fed or intoxicated. When females notice this change in the color of the feathers, they perceive the

male is weak and reject it as a potential father. Because, if the male dies, it is very exhausting for the female to raise the host of sparrows by herself.

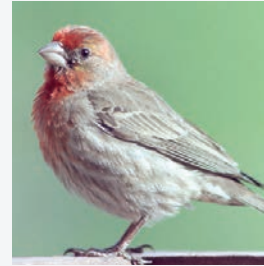


FIG. 4.14 *Carpodacus mexicanus*.

→ Reflect

Read the following questions and write your answers in your notebook.

- Do you know other animals or organisms whose anatomic characteristics make them more attractive to the opposite sex? Give examples.
- Why do you think those characteristics make them more attractive? What do they indicate?

Share your answers with the rest of your classmates.

In his theory of natural selection, Darwin included an explanation about gender sex difference. He explained that, in nature, survival was not the most important factor among living things, it was the ability to leave offspring. It did not matter if a male deer's horns prevented it from escaping a predator, or if a peacock and its beautiful feathers were more easily seen by hunters, it was more important that these characteristics would allow them to reproduce. Darwin suggested that by appealing to the opposite sex, horn owners have the advantage of having offspring that can inherit the same appeal, and also be reproductively successful as a consequence. Years later, several authors mathematically formalized this idea which is now known as the "sexy son hypothesis".

Kells

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SKILLS DEVELOPMENT

Critical thinking skills: Developing hypothesis, risk and speculating, accepting or rejecting other points of view.

EVALUATION OF CONTENT

You should listen to their reasons and they should be able to name them clearly.

SESSION INFORMATION

Week: 29

Sessions: 170, 171

Expected learning outcome: Provide arguments on the importance of the interaction of living things and their relation with the environment as well as the development of diverse adaptations related to reproduction.

Darwin stated that in "intersexual selection" or couple selection, species are structured and strengthen in two ways: one by encouraging competition among males to find a mate, and the other through female selection to have sex (mate) with determined males.

By instinct, females tend to choose the best surviving genes for their offspring, and therefore for their own species. Selection by females can start with the males' horns, but conduct and behavior that indicate they are healthy and strong also influence the selection process (Fig. 4.15).



FIG. 4.15 The male peacock attracts females with his beautiful display of feathers.

With mammals, this situation may be far more aggressive. For example, male deer fight to get a female, while the latter passively watches the scene from a distance (Fig. 4.16). This behavior for attracting the female by means of presents, dances, songs or even fights is known as courtship. This is an adaptation of behavior that has been developed by some animals.

FIG. 4.16 Male animals fight for the females.



Since **plants** do not have mobility, they have had to develop adaptations which allow them to increase their probabilities for reproduction. Among these adaptations, the generation of volatile or easy to evaporate compounds is found. Each plant produces its own volatile compound or perfume, establishing relationships with other plants and animals, especially insects. Pollinators can be: insects, birds, or small mammals such as bats. Plants and pollinators need each other to survive. Many plants, as they evolve, do it in conjunction with their pollinators, thus generating very close interactions. This phenomenon is known as co-evolution.

In this co-evolution process, rewards such as nectar appear, which is a sugar rich liquid strategically located in the flower. So when the insects and birds take it, they touch the stamens and carry the pollen from one flower to another. This type of relation, in which both participants are benefitted is known as **mutualism**.

GLOSSARY

Mutualism. Kind of association between two individuals, where both obtain a benefit, mutualism exists among some birds and hippopotamus species.

Kells

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CONTENT DELIVERY

Start: Students should read pages 96, 97. Ask them comprehension-check questions.

Development: students should write a synopsis following the writing process that is, prewriting, drafting, revising, editing, proofreading, and publishing.

Closing: They should hand in their synopsis.

SKILLS DEVELOPMENT

Critical thinking skills: Synthesizing.

Writing skills: Writing process.

EVALUATION OF CONTENT

Students should hand in their synopsis.

SESSION INFORMATION

Week: 29

Session: 172

Expected learning

outcome: Explain basic similarities and differences between sexual and asexual reproduction.

CONTENT DELIVERY

Start: Students should skim page 98 and tell the difference between asexual and sexual reproduction. Help accordingly.

Development: Read the Hands on activity and students should do it. Help accordingly.

Closing: Students should clearly distinguish between sexual and asexual reproducing living things.

Project preparation:

Form teams of four people. Have them read the lab experiment on page 99 so that they can get ready to do it.

→ Expected Learning

Explain basic similarities and differences between sexual and asexual reproduction.

Comparing Sexual and Asexual Reproduction

Perhaps the most important objective of living things since the beginning of life on the planet 3,500 million years ago has been survival. The only way to do it is by reproduction, generating offspring that remain over time.

Asexual reproduction vs Sexual reproduction.

Asexual reproduction requires only an individual to carry out reproduction and can happen in unicellular organisms like bacteria, as well as in more complex organisms like fungi, some invertebrates like starfish or planarians (flat worms), and plants. In this kind of reproduction the new organisms are identical to their parents (Fig.4.17).

In sexual reproduction, cells from two different individuals are required to produce offspring that will have a mixture of the parents' genes. The two cells that form the new offspring are called gametic cells or gametes, and the best known are the ovum and the sperm. There are some organisms that present both types of reproduction.



FIG. 4.17 Asexual reproduction is found in unicellular and pluricellular organisms.

→ HANDS ON

- Write on a sheet of paper the name of an uncommon organism, it can be a plant, an animal, fungi, or bacteria that you know and the type of reproduction it has; sexual, asexual, or both.
- Place your papers all around the classroom and walk around looking at your classmates' papers. Write down the kind of reproduction you think the organisms have.
- When you finish, go back to your place and check the results with your teacher. Draw on the board statistics with percentages of the organisms you wrote about: how many organisms know with sexual reproduction, how many with asexual reproduction, and how many with both kinds.
- Keep the statistics in your notebooks.

Asexual reproduction

In asexual reproduction we can find different varieties like: bipartition, budding, sporulation, and vegetative propagation. Bipartition consists of duplicating its genetic material and in cells splitting until two identical stem cells are formed. These new cells are fed, and later on, split again just like the cell they came from.

Budding is the reproductive process by which new individuals grow from shoots or buds that are formed and fall from one individual. We find this process in yeast, which are fungi, in ferns, and in some animals such as sea sponges.

Vegetative propagation is very common in vegetables, the most typical example is the strawberry. This plant has creeping stems or stolons which grow as a small net and generate roots at certain distance, leading to the formation of a new plant.

98

Kells

SKILLS DEVELOPMENT

Critical thinking skills: Comparing and contrasting.

EVALUATION OF CONTENT

Evaluation: Students should demonstrate they distinguish sexual from asexual beings.

In the Lab

Material

- Fern plants.
- White sheet of paper.
- Clear container (like the ones used to store food).

Procedure

1. Collect spores. These are grouped on bumps located on the back of the ferns' leaves. It must be considered that ferns produce spores once a year and you should wait for them to ripen. Generally, this happens at the beginning of spring; you will know they are ready when their color is dark brown or black, and they are open. If you collect them before they are ready, they will not germinate.
2. To avoid damaging the ferns' leaves, carefully scrape the spores over a white piece of paper.
3. Prepare the container and add soil with humus and fertilizer (or peat from swamps) and sand. Distribute water evenly, using a sprinkler, or wet the soil and drain.
4. Plant the spores directly, without covering them with the soil. Cover the container and place it in a warm place (between 22° and 25 °C). Be careful that it does not get direct sunlight. Maintain environment humidity at 80% or more.
5. Seed irradiating young plants in the winter will allow a more regular production. Apply light with fluorescent tubes, or place the plants near a window where the sunlight gets through during sunset. When the new plants appear, they will need more light, but never direct sunlight.
6. When a mass of seedlings is formed, separate them in small blocks and transplant them in well drained pots, maintain a warm temperature and humidity.
7. Once plants have reached between three and five centimeters of height, transplant them in individual pots with a diameter of 7.5 cm.

Results

- It is important that you keep a record of when you planted the spores, when the seedlings were formed, and finally the time it took them to reach 3 and 5 cm.
- Do you think they can be planted at school?

Sexual reproduction.

Sexual reproduction involves the cells of two different individuals to make a new organism. Cells receive the name of gametes. When two gametes unite, each one gives away genetic information, so the new organisms is similar, but not identical to its parents because it has genetic information from both. This is what sexual reproduction is about: exchanging information to give origin to a new organism, similar to parents, but not identical, it means that there is variability.

There are different kinds of sexual reproduction, for example hermaphrodites, which have both genders. There are also unisexual organisms that need another organism of the opposite sex to reproduce.

Kells

99

SESSION INFORMATION

Week: 29

Session: 173

Expected learning outcome: Explain basic similarities and differences between sexual and asexual reproduction.

CONTENT DELIVERY

Start: Students should name 2 sexual and 2 asexual beings.

Development: Students should do the experiment and write down the result they get.

Closing: They should show their experiment.

SKILLS DEVELOPMENT

Logical/Mathematical skills:
Experimenting.

EVALUATION OF CONTENT

Students should show their experiment result. Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 29

Session: 174

Expected learning

outcome: Explain basic similarities and differences between sexual and asexual reproduction.

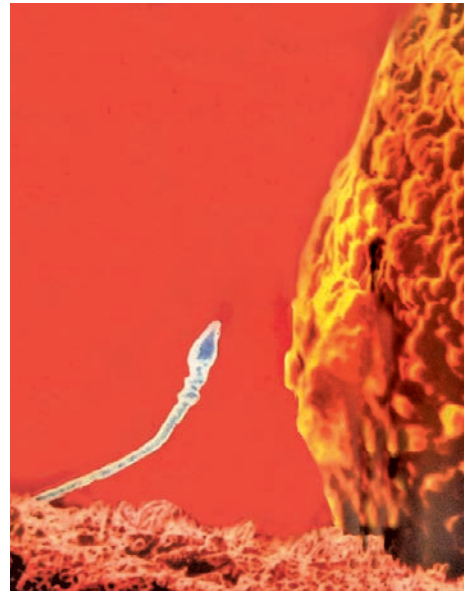
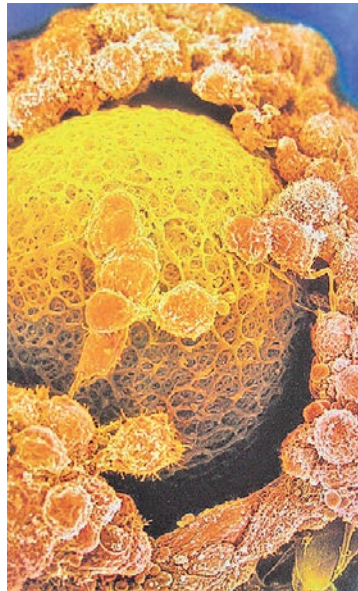
CONTENT DELIVERY

Start: Students should briefly summarize what sexual and asexual reproduction is.

Development: Students should read pages 98 – 100 and mind map the basic similarities between sexual and asexual reproduction.

Closing: Ask them five comprehension-check questions at random.

FIG. 4.18 A haploid is an organism or cell having only one complete set of chromosomes. When they bind they form a diploid which has a double amount of chromosomes.



GLOSSARY

Haploid. Having the gametic number of chromosomes typically including one of each pair of homologous chromosomes.

Diploid. Having two haploid sets of chromosomes in any of its developing faces. All cells in human beings, except gametes, are diploids.

Gonad. A reproductive gland (as an ovary or testis) that produces gametes.

The sexual cells or gametes are **haploids**, this means that they have half the number of chromosomes of its species, when they bind, they form an egg or species that is **diploid**, and therefore has the complete number of chromosomes for its species. When the zygote develops all its cells, it is called somatic or diploid (Fig. 4.18).

In plants we can find flowers with both genders, this means they are hermaphrodites. There are plants that have unisexual flowers, they are both male and female. These are called monoecious, from Greek *mon* one + *oikos* house, one house. In this category we find corn and pumpkin. On the other hand, plants in which we find male and female flowers are

called dioecious, from Greek *di* + *house* two houses; like willow, palm, and hop. In animals the production of sexual cells or gametes occurs in specialized organs called **gonads**. In **vertebrates**, gonads produce male gametes and are called testicles, while the gonads which produce female gametes are called ovaries.

Animal reproduction takes place with the participation of male and female, different gender organisms.

100

SKILLS DEVELOPMENT

Critical thinking skills: Summarizing, classifying, mind mapping.

EVALUATION OF CONTENT

Evaluate their mind map and their answers in the comprehension-check questions.

The Relationship Between Chromosomes, Genes and DNA with Biological Heritage

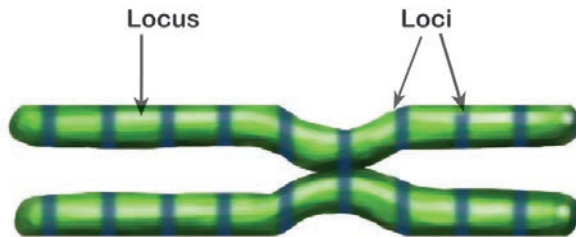
All cells carry genetic information

Cells of all living things divide themselves, in some cases to give place to other cells called somatic cells, which build up the tissues, organs, and parts of living things and in others give place to sexual cells or gametes. In the specific case of vertebrates, the **somatic cells** divide throughout their lifetimes, but do not create a new organism.

During growth, their cells do not stretch, but divide and increase in number, so when the number of cells increases, we grow and gain weight. This kind of division is called mitosis, and each time this process takes place, the number of chromosomes in each cell remains constant. Human beings, for example, have 46 chromosomes or 23 pairs. When each of our somatic cells divides, it gives place to two other new cells which have 46 chromosomes too, and are called diploids.

Chromosomes are very compacted DNA structures (deoxyribonucleic acid) this is the molecule where all the genetic information is found. This is all we are, how we function, where we come from, even what can make us sick.

Each species, animal or plant has a specific chromosome number and the chromosomes contain **genes** that have its information. Inherited characteristics are called phenotype, what is physically expressed in an individual, and usually the characteristics of the dominant genes. Remember that there is information that is not seen, but we possess. These genes are called recessive genes that can be expressed by stimuli. Genotype is all the genetic information; perceived or not (Fig.4.19).



→ Expected Learning

Identify the participation of chromosomes in the transmission of biological characteristics.

GLOSSARY

Somatic cells. All the cells in the body that are not gametes.

Gene. Fragment of DNA that carries information to synthesize a protein.

FIG. 4.19 The place each gene takes in a chromosome is known as locus, from Latin "place". Locus is singular, loci are plural, and it means that parts of the same gene or different versions, can be in different places of the chromosome.

→ Reflect

- Why do all living things look like their parents?
- Do you know where genetic information is found?

Kells

101

SESSION INFORMATION

Week: 30

Session: 175

Expected learning outcome: Identify the participation of chromosomes in the transmission of biological characteristics.

CONTENT DELIVERY

Start: Have students read the questions in the Reflect box in the bottom of the page. Discuss it in whole class.

Development: Have students read the page individually. Help them out as necessary to clarify vocabulary problems. Then, students should draw how they imagine mitosis, diploids, chromosomes, genes, phenotype and genotype are or look like.

Closing: Have different students show the drawings they come up with.

Homework: Students should read page 102 to see the materials they will need for the lab practice. In teams, they will decide who will bring what.

SKILLS DEVELOPMENT

Critical thinking skills: Imagining.

Visual/Spatial skills: Building models.

EVALUATION OF CONTENT

Students should have their drawings checked.

SESSION INFORMATION

Week: 30

Session: 176

Expected learning

outcome: Identify the participation of chromosomes in the transmission of biological characteristics.

CONTENT DELIVERY

Start: Students should get in teams and check they have everything they need for the project. Explain what you will evaluate in the project and in the project report.

Development: Students should read again page 102, follow the instructions and complete the experiment. Help them as necessary.

Closing: Students should write down the report following the writing process: Pre-writing, drafting, revising, proofreading and publishing.

In the lab

Purpose

- In this activity you will observe the chromosomes in plant cells.
- Before starting, find out how many chromosomes there are in an onion.
- Five days before you begin, prepare the biological material: insert wooden toothpicks (at least three) in an onion. Place it over a glass with water so the green stem is suspended, and the other part of the onion is in contact with the water.

Material

- Microscope.
- Microscope slide.
- Cover slip.
- Scissors.
- Dissection needle.
- Forceps to hold hot objects.
- Dissection forceps.
- Toothpicks.
- Filter paper.
- Alcohol burner.
- A medium size glass.
- Watch glass.
- Acetorkein solution.

Biological material

- One onion (Fig. 4.20).



FIG. 4.20 Onion.

Procedure

1. Get the biological material you prepared; after five days, little roots should have started growing on the onion.
2. Pour 3 ml of acetorkein on the watch glass.
3. Cut the tips of the roots that grew on the onion and place them on the watch glass.
4. Warm the watch glass with the alcohol burner and remove. Check that the acetorkein does not boil. Repeat again and again for 8 minutes. Stop doing it when the acetorkein starts to evaporate.
5. With the dissection forceps, take one of the roots from the glass and place it on the microscope slide. Next, place the cover slip and with a pencil eraser, softly tap on the cover slip so you can watch how the tissue in the root expands; be careful not to break the cover slip. Finally, place the filter paper so the excess of acetorkein can be absorbed. The root tissue should be an almost transparent layer between the microscope slide and the cover slip.
6. Look in the microscope.
7. Record your findings in your notebook.

Results

- Report if you could see the onion's chromosomes.
- Did the chromosomes look the same in all the cells? Was there a difference?
- Why do you think you saw the cells' chromosomes in a different location and different quantity?

102

SKILLS DEVELOPMENT

Logical/Mathematical skills: Experimenting.

Writing skills: Writing process.

EVALUATION OF CONTENT

The experiment outcome; the experiment report following the writing process.

Mitosis and meiosis: two kinds of cellular division

In mitosis, cells divide into two identical cells. First, they have to duplicate all the DNA that forms the chromosomes, this is the genetic material, and later mitosis begins. This is a process in which the duplicated chromosomes separate and segregate into the cell's poles, so at the end, the cell divides and turns into another daughter cell with the same number of chromosomes.

Meiosis only happens when gamete cells are produced, (ovum and sperm). The genetic material has to end up with half of the material, so when a sperm fertilizes an ovum, the chromosome number of the species reestablishes.

For example, each human sperm contains 23 chromosomes, and when it fertilizes an ovum, the 46 chromosomes are completed because there are 23 more chromosomes in it. Each of the gametes has half of the genetic information.

In meiosis, as well as in mitosis, the genetic material is doubled first, and then it divides twice and has four daughter cells with half the chromosomes. We have studied that human beings have 46 chromosomes from which our biological sex is determined; these are called sexual chromosomes. Instead of being designated by a number, they are called XX or XY chromosomes (the other chromosomes are designated as pair 1, pair 2, and so on, up to pair 22).

The female chromosome is XX and the male is XY. When we observe the karyotype of a woman, the sexual chromosomes are the same shape and size, while in a man's karyotype, the sexual chromosomes are uneven; chromosome X is large, and chromosome Y is small. When meiosis takes place, ovum always carry 22 somatic chromosomes and a sexual chromosome, which always is X. Sperm carry 22 somatic chromosomes and either an X or Y chromosome. As you probably already realized, the sperm is responsible for the sex of the new living organism.

→ HANDS ON**Answer in your notebook**

1. Which are some of the inherited diseases you know? Is there one in your family?
2. Do you know someone who has a hereditary disease in his, her family?
3. Find out if there are hereditary diseases related to sex.
4. What are chromosomal aberrations? Name them.
5. What is the difference between a hereditary disease and a chromosomal aberration?

SO FAR YOU HAVE LEARNED THAT...

- Reproduction is a common process in all living things.
- The difference between sexual and asexual reproduction.
- The importance of sexual reproduction as a source of variability.
- Living things have adapted to reproduce and there are different kinds of adaptations that include relationships with other organisms.
- There are two kinds of cellular division: mitosis and meiosis, and they take place in different kinds of cells: somatic, and sexual.
- Phenotype is the genetic information that is perceived, and the genotype is all the genetic information of an organism that may or may not be perceived.
- Genetic information is in the chromosomes and we find the genes there.
- The inherited chromosomes transmit genetic information.

103

SESSION INFORMATION**Week:** 30**Session:** 177

Expected learning outcome: Identify the participation of chromosomes in the transmission of biological characteristics.

CONTENT DELIVERY

Start: Students should read the questions in the Hands On box and answer them in pairs. Help them find out the meaning of chromosomal aberrations. Check their answers in whole class.

Development: Students should read page 103. Ask them comprehension-check questions. Prepare pictures of a feminine and a masculine karyotype. Have students identify which is which according to the description mentioned in the book.

Closing: Students should discuss the following questions:
Who is responsible for the child's sex, the mother or the father?
Why? Give reasons based on the information you've read.

SKILLS DEVELOPMENT

Naturalistic skills: Observing details.

Intrapersonal skills: Introspecting, developing an opinion.

EVALUATION OF CONTENT

Students should easily identify the karyotype and tell the definitions of mitosis and meiosis.

SESSION INFORMATION

Week: 30

Session: 178

Expected learning

outcome: Recognize that scientific and technological knowledge associated with genetic manipulation are permanently updated and depend on the society where they evolve.

CONTENT DELIVERY

Start: Prepare two pictures of maize. One of a non-transgenic crop and the other one of a transgenic crop. Have students comparing them and saying the advantages and disadvantages they see.

Development: Have them read the article. Give them time to look for new terms in a dictionary. Ask them comprehension-check questions.

Closing: Students should ask and answer the questions in the Reflect box in pairs. Monitor their work and help accordingly.

Homework: Students should take their favorite food recipe printed out for next class.

→ Expected Learning

Recognize that scientific and technological knowledge associated with genetic manipulation are permanently updated and depend on the society where they evolve.

Identifying the Undetermined Nature of Scientific and Technological Knowledge Regarding Genetic Manipulation

Reading

The development of genetic techniques in plants, the growing number of species susceptible to transformation by this technique, and the most recent release of seeds of transgenic plants (genetically modified organisms by human hand), have caused a change in agriculture.

Generating more plants resistant to pests or with better nutritional characteristics. An example is the creation of grass resistant to the infection of a unique species of fungus, causing other less resistant grass species to be displaced. It has been recommended, even required, to mix.

For some years now, we have reconsidered the advantages of traditional systems and the need to study them, since they do not affect ecosystems so much and prevent environment degradation.

Within traditional techniques there is one called poly-culture, which is facing a dilemma: To continue favoring monoculture, with the use of transgenic varieties, or to choose the biologic and cultural diversity, while still using biotechnology.

It has been recommended even required, to mix genetically transformed cultures with non-transgenic plants to delay pests and weeds developing a resistance to the plants. There should be more of an effort to study and implement poly-culture, including creole crop materials, as well as the tolerance of wild crop relatives in the cultures, to promote conservation, and cushion the effects of the GMOs (genetically modified organisms). Nowadays, we work on the selection of varieties of maize, that can grow with a low nitrogen content. As opposed to the dictated tendency, we should have varieties that respond to fertilization, creating the need to use more and more fertilizers. In this case, genetic engineering should focus on the selection of crops that make plants able to survive and produce minimum amounts of nitrogen and help get rid of nitrophilous varieties that have generated indiscriminate use of fertilizers.

→ Reflect

Discuss in groups

- What do you know about GMOs?
- Are vegetables the only transgenic?
- What do you think about maintaining biodiversity?
- What do you think about reducing the use of fertilizers by introducing new species?
- Are all GM crops resistant to pests? Why?
- According to what you discussed, does science solve all the problems?

104

SKILLS DEVELOPMENT

Critical thinking skills: Comparing and contrasting.

Naturalistic skills: Observing details.

Speaking skills: Topic talking, discussing.

EVALUATION OF CONTENT

Students should respond to your comprehension-check questions giving arguments mentioned in the article. They should be able to respond to the questions in the Reflect box.

Kells

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During the 1940's, it was known that the "substance" responsible for heritage was found in the cell nucleus. Experiments done by Oswald T. Avery, Colin MacLeod and Maclyn McCarty described that the transforming substance and heritable exchanging bacteria is DNA.

Research focused on discovering how DNA is structured, how orders are transmitted inside a cell and how it is mainly transmitted from cell to cell. In the 1970s, successful and extraordinary techniques were discovered, allowing manipulation and modification of DNA. These techniques are called genetic engineering techniques or recombinant genetics. Thanks to these methods, specific fragments of DNA (genes) can be obtained in unlimited quantities and be inserted in a different specie.

Today we can determine the sequence of genes, alter them and introduce them into another species, either in somatic or germ cells. Through these genes we are able to know what disease we have or will have. We can establish paternity, and even clone mammalian cells to obtain complete organisms from cloning nuclei (Fig. 4.21).



FIG. 4.21 Dolly was the first cloned mammal from an adult cell in 1996. This led to advances in life sciences and biotechnology.

Transgenics, good or bad?

In plants, as well as in all sexually reproducing organisms, gene transference has occurred through **sexual crossbreed**, and even though it was supposed to be restricted to organisms of the same species, gene exchange with other species also happens. For example, about 200 genes that come from other microorganisms were found in the human genome. They were probably acquired through horizontal transference (not vertical, as in that of parents and children). Horizontal transference is the acquisition of genetic material through infection with organisms of other species. In plants, horizontal transference occurs through infection due to bacteria, *agrobacterium tumefaciens*, that causes a sickness known as "crown gall", so that there is no transference of genes through sexual reproduction. Taking advantage of this situation, scientists decided to modify bacteria before it infects plants. They removed the gene that produces the galls and introduced the required genes, so that the plant resists pests or synthesizes certain compounds.

The human genome project

From the very beginning, the main goals of the genome project were:

1. Locate all human genes and characterize them.
2. Know the structure and normal function of proteins that are encoded by genes.
3. Identify the genetic variants and mutations that cause diseases or that predispose them.
4. Know the effect of mutation on the synthesis, degradation, structure and function of proteins.
5. From the aforementioned, have the means for better diagnosis, treatment and prevention of genetic diseases that affect human beings.

However, it has been known that the genome does not solve everything. For example, the sequence published in 2001 was not complete, because there are genome regions where a lot of information is repeated and it is difficult to order these fragments. In fact, every three years minor modifications are reported in the genome.

GLOSSARY

Sexual crossbreed. It refers to the fusion of gametes that, in the case of plants, are pollen and ovum.

105

SESSION INFORMATION

Week: 30

Session: 179

Expected learning outcome: Recognize that scientific and technological knowledge associated with genetic manipulation are permanently updated and depend on the society where they evolve.

CONTENT DELIVERY

Start: Students will cut out one of the ingredients and one of the steps in their recipe. Then, they will exchange them with another classmate. Ask them what they think of the new recipe. Do they like it? Does it sound like a better recipe? Would they like to try it? Explain that genomic manipulation is doing exactly the same thing. Ask them to reflect on it. Do you think it will lead to a good result? Discuss it and later read about it.

Development: Have them read page 105 up to the Transgenic, good or bad? Paragraph. Discuss whether transgenic manipulation is good or bad.

Closing: Students should read what the human genome project is about. Later, they will discuss the questions in the Reflect box on page 106.

SKILLS DEVELOPMENT

Speaking skills: Discussing.

Intrapersonal skills: Developing an opinion.

EVALUATION OF CONTENT

Students should be able to give reasons for or against transgenic manipulation.

SESSION INFORMATION

Week: 30

Session: 180

Expected learning

outcome: Recognize that scientific and technological knowledge associated with genetic manipulation are permanently updated and depend on the society where they evolve.

CONTENT DELIVERY

Start: Ask students if they know somebody who was born with a physical limitation. If they don't know anyone, show students pictures of babies with some kind of limitation.

Development: Students should read on page 106 the paragraph called Gene Therapy. Have students look new terms up. Later, ask students to discuss whether gene therapy is a good solution to physical limitations even though it has been proved that a specific gene has multiple functions; hence, genes cannot be simply exchanged without expecting modifications in other aspects.

Closing: In teams, students should reach an agreement on gene therapy.

GLOSSARY

Gene therapy. Therapy that involves inserting, by a vector, DNA or functional genes in cells where there is lack of a specific genetic material.

The genome has shown that racial differences are of recent origin and superficial in genetic terms, this means that we are quite similar genetically speaking, and therefore the term "race" is obsolete.

➔ Reflect

- Do you think that research on the human genome may end discrimination problems like racism?
- What are the advantages of knowing about the human genome?
- What are the limitations of genome knowledge regarding metabolism?
- Can we predict if a person will have a disease by knowing the human genome?

Gene therapy

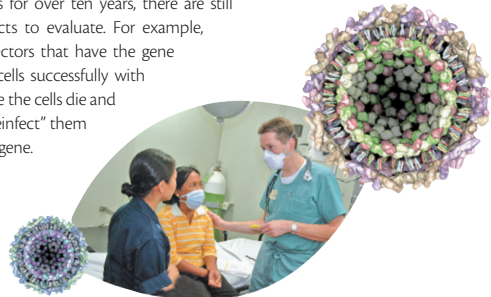
When we manipulate a cell's genetic material (DNA) to cure a disease we are performing **gene therapy**. This can be done in somatic cells or gametes. Nowadays, genetic therapy in sexual cells is not so well accepted, because if there is an undesirable effect, after making a change, it would be transmitted to other generations.

How does genetic therapy work? For example, in the disease called severe combined immunodeficiency, people cannot produce a protein which is necessary for B and T cells to function properly, and all because of a mistake in a gene. These cells are known as lymphocytes and are responsible for protecting us against viruses or bacteria. As the error is only in a gene, researchers thought about removing defective cells of patients and growing them. Once they had grown a sufficient number, these cells were inoculated with a "benign" virus that carried a healthy gene to produce this protein (Fig. 4.22).

Some of these cells manage to include the "good" gene in their genome and then it is said they have been transformed. These transformed cells are again grown in cultures, and reintroduced in the patient. So far, several patients with this disease have been successfully cured with gene therapy, but they still have to be monitored and have to repeat the treatment every six months, since cells die and not all replicate with a healthy gene.

Although this therapy has existed in the world of medical research and genomics for over ten years, there are still many important aspects to evaluate. For example, the construction of vectors that have the gene of interest and infect cells successfully with the defective gene since the cells die and must be replaced or "reinfect" them again with the healthy gene.

FIG. 4.22 Viruses are used as vectors to introduce healthy genes in sick people.



Kells

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SKILLS DEVELOPMENT

Speaking skills: Discussing.

Intrapersonal skills: Developing an opinion.

EVALUATION OF CONTENT

Students should be able to give reasons for or against gene therapy.

Project

Towards the Creation of a Responsible and Involved Citizenship

Expected learning:

- Identify different routes to solving the stated problematic situation.
- Consult different information sources to gather documentary evidence for the topics of the chosen project.
- Determine the scientific, political, economic or ethical components of the situation to be addressed.
- Use different media to communicate the results of the project.

Project: What would the main implications in a teenager's life be in case of pregnancy, HIV infection or other sexually transmitted diseases?

How can we promote the prevention of HIV in our community?

What are the benefits and risks of GMO food crops?

1 Introduction

Sexuality implies well-informed and responsible decisions. This project aims to find out the information that your community has about teenagers' sexual knowledge, for example the implications about teenage pregnancy, or how much information they have about STDs, specially HIV.

2 Getting started

In this project you will determine the situation or problem that you will investigate; what are the scientific, political, economic, even ethical components, presented as part of the problem and solution?

3 Informed decisions

In teams, plan your work and discuss what the question you will answer and why it is important to communicate it to your community.

1. Identify the available resources necessary to carry out your preliminary investigation about teen pregnancy, HIV, HPV and STDs in general in Mexico: computers, the web, books, libraries, etc.
2. Discuss and establish how you can find the information your community has about the chosen topic.
3. Specify what kind of information you need to collect in your community, and how it will be reported, for example: What population group is more informed, the ones from 12 to 15 years or older or parents?
4. Assign roles based on preferences and abilities of each of your team members to coordinate and perform each activity.
5. Make a work schedule, and keep in mind it must include follow up activities and work evaluation.

4 How to do it?

Hereby we propose some activities that your team could follow to develop the project.

1. Go to the library and consider other places where you can find information.
2. Make questions to be included in your survey to get the information from your community.

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SESSION INFORMATION

Week: 31

Sessions: 181 - 183

Expected learning outcome: Apply the unit content to develop a project.

CONTENT DELIVERY

Unit 4 Project Presentation. Students should read the project and agree on how it should be presented. During the project presentations, follow the rubrics to evaluate it.

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering, self-monitoring, self-evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

SESSION INFORMATION

Week: 31

Sessions: 184 - 186

Expected learning

outcome: Apply the unit content to develop a project.

CONTENT DELIVERY

Students should read the project and agree on how it should be presented. During the project presentations, follow the rubrics to evaluate it.



FIG. 4.23 Condoms are effective in preventing STDs.

FIG. 4.24 An expert's opinion about this topic is important, such as doctors, nurses and researchers.



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3. Establish whether to carry out oral interviews or give questionnaires, and who will be interviewed.
4. Discuss your results. Review answers in detail and get the percentages of each response. With this information, draw charts and graphs.

5 Communicate your results

Decide how to communicate your results to the community. How informed is the population that you interviewed about the topic you chose? Which preventive methods do they know? (Fig. 4.23). Is there discrimination towards pregnant teenagers or people with STDs?

6 Evaluation

Finally, it is necessary to reflect on what you learned while you carried out this task, the information available in your community, as well

as the teamwork and all the research. To do this assessment as a team, discuss the experiences, highlight benefits and problems faced during your research. The following questions may help you reflect, answer them individually.

About teamwork:

- How did you feel working in a team?
- Did you discover unexpected skills in some of your teammates?
- Did you discover skills that you did not have, and feel good to discover them? Or, did you know there were things you could do better because of your skills?
- What did you like the most about the project?

About research:

- What sources of information were new to you?
- Could you use others? Which ones?
- Did you achieve all the proposed objectives?
- If not, why?
- Do you consider the final work could have been better?
- How could you improve it?
- What knowledge from the unit did you apply in the development of this project?
- What was the most important thing you learned in the project?

SKILLS DEVELOPMENT

Metacognitive skills: Planning, organizing, delivering, self-monitoring, self-evaluating.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Evaluation

Choose the right answer for each question. In some cases, more than one option may be correct.

1. Sexuality is a cultural construction because:

- a) It is manifested through artwork.
- b) It is acquired through family education.
- c) It is acquired through information in school.
- d) It is acquired through family education, social environment and shows itself throughout life.

2. Gertrude is a teenage girl. Her best friend confessed that she started having sexual intercourse with her boyfriend, but she did not use protection because according to her, "you cannot get pregnant during the first sexual encounter". If you were Gertrude what would you tell her?

a), c), d) may be correct.

- a) His argument is false and she can become pregnant from the first sexual encounter.
- b) In the following encounters she must use protection because she can become pregnant.
- c) This argument is false, and if it has not been more than 3 days since she had sex, she should contact her physician to get a recommendation about an emergency contraception system.
- d) The argument is false, she has to visit a doctor because she can acquire an STD.

3. Choose the option which indicates the best strategy to prevent STDs.

All options may be correct.

- a) Abstinence.
- b) Adequate information and use of criteria to decide how, when, with whom and always using a condom.
- c) Adequate information and abstinence.
- d) Using a condom in every sexual encounter.

4.

a) Sex is a biological characteristic that includes all anatomic and physiological manifestations that make us different as men and women.

Gender has to do with the set of ideas, manifestations, creed, representations and social attributes built up in each culture having sexual differences as a basis.

Sexuality manifests through gender, affectionate bonds, eroticism and reproduction.

Sexual intercourse involves pleasure, and health and reproductive aspects.

b) The main advantage of these contraceptives are that women won't get pregnant after sexual intercourse.

4. Answer the following questions:

- a) What is the difference between sex, sexuality, sexual intercourse and gender?
- b) What are the main advantages of chemicals, mechanics, and natural contraceptives?

Choose the right answer for each question In some cases more than one option may be correct.

5. Point out the morphological adaptation which help species have success in reproduction.

b) and c), may be correct.

- a) Courtship.
- b) Vivid colors.
- c) Ornaments.

6. Co-evolution occurs when:

- a) The male and female decide to share responsibility of raising offspring.
- b) Two different species suffer modifications to facilitate, for example, the power of one and the reproduction of the other, such as specific flower pollinators of certain species.
- c) Two species present adaptations to share the same environment without competing for the same resource.

7. In asexual reproduction, the offspring:

b) and c), may be correct.

- a) Has the same parent but different genetic information.
- b) Has the same parent and the same genetic information.
- c) There is no genetic recombination and the offspring looks the same as its parent.

109

SESSION INFORMATION

Week: 32

Sessions: 187 - 189

EVALUATION

CONTENT DELIVERY

Start: Students should answer to pages 109 and 110 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 125 and 126 along with the answer key, page 127.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

SKILLS DEVELOPMENT

Metacognitive skills: Self-monitoring, self-evaluating.

SESSION INFORMATION

Week: 32

Sessions: 190 - 192

CONTENT DELIVERY

Start: Students should answer to pages 109 and 110 prior to taking the unit assessment. Go through the answers; help them with techniques to study content they do not remember clearly.

Development: Students are to take the unit assessment. You can find it in the Teacher's Guide pages 125 and 126 along with the answer key, page 127.

Closing: Check their assessments, record the score and provide with feedback. You might want to use the Attendance and Evaluation formats that you can find the Teacher's Guide pages 135 to 137.

8. Answer briefly:

- d) What are the main differences among sexual and asexual reproduction?
- e) What is the difference between sex and sexual reproduction?
- f) Where is all the genetic information of an organism is found?

Choose the right answer for each question. In some cases more than one option may be correct.

b) and c), may be correct.

9. GMOs (genetically modified organisms) are:

- a) Organisms genetically modified by successive crosses until an organism with the desired characteristics is obtained.
- b) Genetically modified organisms in which a gene or genes are introduced from other species to give them special characteristics.
- c) They are organisms generated through the cloning of mutated organisms.

10. Nowadays the human genome is fully known, therefore:

- a) More research is no longer needed since, all the required information in the genome.
- b) It is necessary to continue investigating, since the genome is subject to other factors that regulate their expression.

8.

- d) **Asexual reproduction requires only one individual to carry out reproduction and can happen in unicellular organisms. Sexual reproduction requires cells from two different individuals to have an offspring.**
- e) **Sex is a biological characteristic that includes anatomic and physiological manifestations that make us different as men and women. Sexual reproduction needs intercourse to produce offspring.**
- f) **Genetic information is found in the nucleus.**

Student book U5



Health, Environment and Quality of Life

Skills

- Understand phenomena and natural processes from a scientific perspective.
- Make well-informed decisions to take care of the environment and promotion of health focusing on a culture of prevention.
- Understand the scope and limitations of science and technological development in several contexts.

Expected Learning

- Ask smart questions to favor content integration.
- Introduce different strategies and choose the most appropriate one, according to their possibilities, to solve problematic situations.
- Create products, solutions and techniques using imagination, and creativity.
- Take part in organizing forums to spread the results of the project.

SESSION INFORMATION

Week: 33

Session: 193

Expected learning

outcome: Students will identify the final project requirements.

CONTENT DELIVERY

Start: Students should read the final project options and in teams, choose one. Then, they should plan and organize their project.

Development: The teacher might decide how long the final projects presentations should take. The teacher should also make clear the project evaluation criteria. Follow the Teacher's Guide projects rubrics on page 132.

Closing: Students should do the self-evaluation procedure.

SKILLS DEVELOPMENT

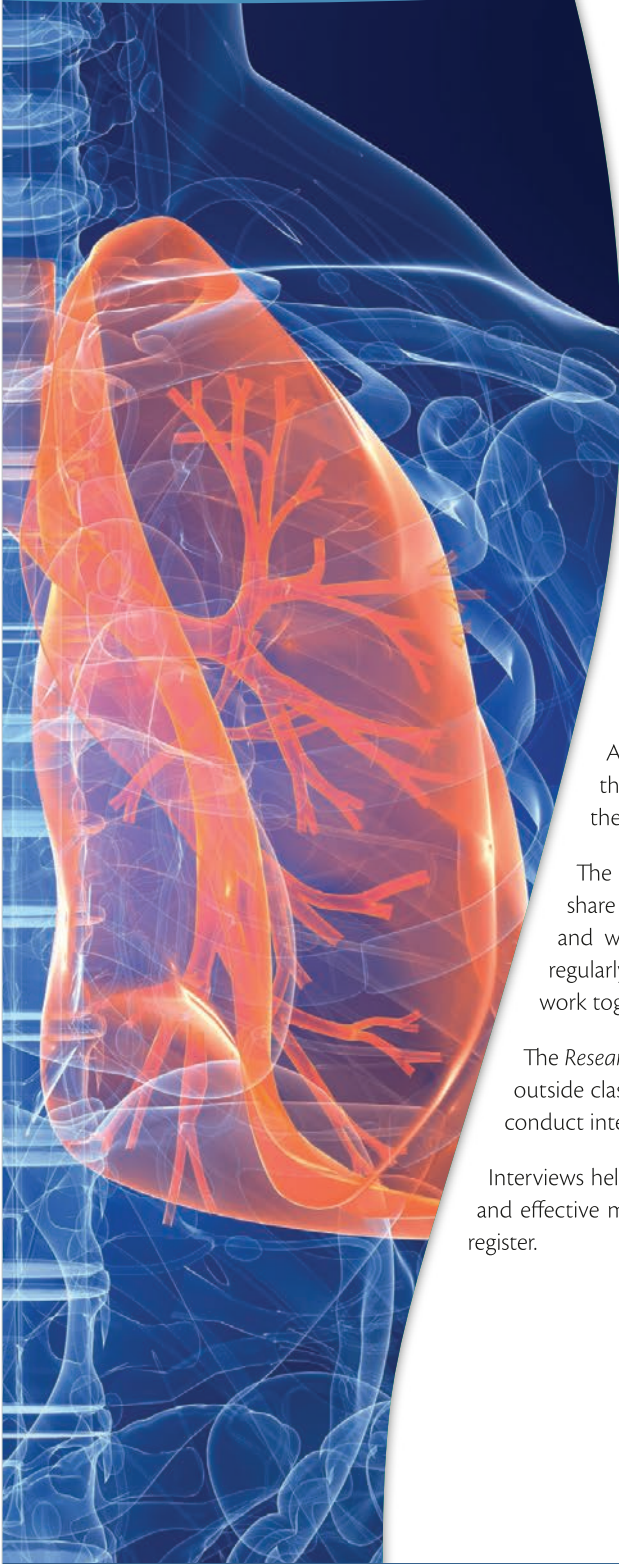
Critical thinking skills: Experimenting.

Metacognitive skills: Planning, organizing, delivering, self-monitoring, self correcting.

EVALUATION OF CONTENT

Follow the Teacher's Guide projects rubrics on page 132.

Teaching Strategies



Biology offers lessons designed for a 50-minute class. For the beginning of each class you will find a lead-in or warm up activity to capture students' attention.

After doing so, every lesson includes a variety of activities such as readings, experiments, questionnaires and projects that will give students opportunities to develop different skills and competencies in science as well as in English language.

The aim is to engage students and expand their knowledge through thinking and reflecting on science as they work individually, in pairs or teams. You will be the guide and facilitator up to the final activity. The concepts and objectives set at the beginning will be utilized here to accomplish the goals.

At the beginning of each unit, both students and teachers will be able to recognize the skills and competencies to be developed, in order to have a clear understanding of learning outcomes to be achieved throughout the units.

At the beginning of each unit there are readings that contextualize the information from the prior unit with what is to be learned in the upcoming unit.

The activities help students to focus their attention on the topic, to share their ideas and to learn to cooperate since students gain learning and working skills from teamwork. It is advisable to change teams regularly by numbering students, 1-5. You can call for all number 2s to work together and so on.

The *Research* section of the book aims to expand curiosity and knowledge outside class. Students take what they have learned in class to prepare and conduct interviews. These projects are then presented to the class.

Interviews help students to develop assertive communication, active listening and effective management of information as well as to use different language register.

In the *Hands On* sections, students complete information through the use of graphic organizers, (charts, diagrams, etc.) that later can be increased by developing conceptual maps allowing the incorporation of new concepts and reviewing the previous ones. These graphic organizers can also be shared with the rest of the group by having presentations that facilitate group interaction.

The strategies used throughout the book include debates, arguments and role-play. The goal is to motivate and engage students in doing research, analyzing information, drawing results and sharing information with the class. Doing so, you are facilitating target language use for new purposes and fostering self-esteem in students.

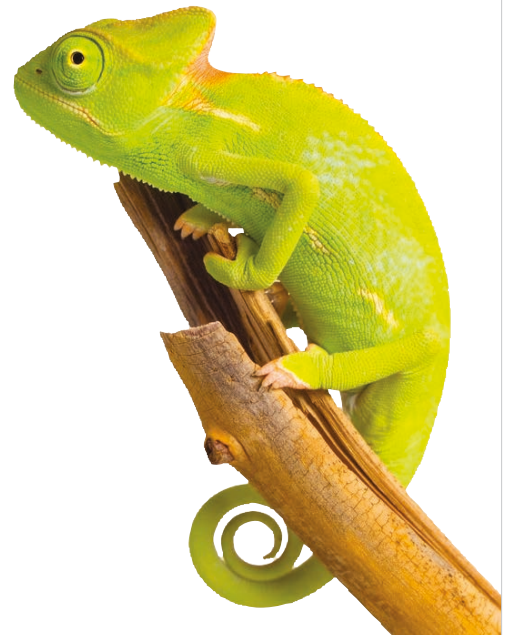
All of the strategies proposed in the book are designed to develop skills and competences in students by actively engaging them to enjoy learning biology in an interesting and motivating way as curiosity awakens in every lesson.

Finding problems to solve or exchanging points of view are challenging tasks that can be used to keep students motivated, as well as having them work in a collaborative and respectful environment.

A very important aspect to keep students motivated is to make them realize how much they are learning. However, it is necessary that teachers encourage students by expressing their satisfaction when perceiving effort and progress.

With your experience, enthusiasm and guidance, students will succeed at accomplishing every goal and acquiring a very rich perspective on Biology.

The authors



Biology

Unit 1 Assessment

Date: _____

Name: _____

1. Match the columns

- | | |
|---|-----------------------|
| a) Formed by atoms or molecules, not cells. Do not have self motion and do not respond to stimuli. | () Irritability |
| b) Beings capable of carrying out vital functions such as: Nutrition, reproduction, metabolism, irritability and death. | () Cells |
| c) It is the anatomic and functional unit of living things. | () Living things |
| d) Living things capacity to respond to environmental stimuli. | () Non-living things |

UNDERLINE THE CORRECT ANSWER

2. Organisms which contain several cells are:

- a) Autotrophs.
- b) Multicellular.
- c) Unicellular.
- d) Heterotrophic.

3. Organisms that manufacture their own food through photosynthesis are:

- a) Autotrophs.
- b) Multicellular.
- c) Unicellular.
- d) Heterotrophic.

4. Organisms that feed with other living things such as mushrooms and animals are:

- a) Autotrophs.
- b) Multicellular.
- c) Unicellular.
- d) Heterotrophic.

5. The number and variety of living things that live in one place are known as:

- a) Biology.
- b) Ecosystem.
- c) Biodiversity.
- d) Territory.

6. Biodiversity threats are:
- a) Pollutants, climate, deforestation.
 - b) Pollutants, species overexploitation, deforestation and rainforests for growing areas, Pollutants, species, ecosystems, families.
7. Living things group, the environment in which they develop, relationship among them and their environment are known as:
- a) Biology.
 - b) Ecosystem.
 - c) Biodiversity.
 - d) Territory.
8. Herbivores consumers are known as:
- a) Secondary consumers.
 - b) Tertiary consumers.
 - c) Primary consumers.
 - d) Decomposers.
9. What happens if secondary consumers increase in a food chain?
- a) Primary producers and consumers increase.
 - b) Primary producers and consumers decrease.
 - c) Tertiary consumers increase, primary consumers decrease and producers increase.
 - d) Tertiary consumers decrease, primary consumers and producers increase.
10. Ecosystems keep balanced mainly by:
- a) Water and carbon cycles.
 - b) Water cycle.
 - c) Carbon cycle.
 - d) None of the above.
11. Which is the science that classifies and categorizes living things:
- a) Aristotle.
 - b) Carl Von Linnaeus.
 - c) Taxonomy.
 - d) Zoology.
12. Greek philosopher who classified living things in plants and animals for the first time:
- a) Aristotle.
 - b) Carl Von Linnaeus.
 - c) Taxonomy.
 - d) Zoology.

- 13.** Naturalist who classified living things, gave a scientific name to each living thing formed by genus and species:
- a)** Aristotle.
 - b)** Carl Von Linnaeus.
 - c)** Taxonomy.
 - d)** Zoology.
- 14.** How were plants and animals parts or structures that lived thousand or million years ago, which are still kept through different forms called?
- a)** Still life.
 - b)** Fossils.
 - c)** Carbon 14.
- 15.** Where did Charles Darwin explore for five years?
-

Biology

Unit 1 Assessment Answer Key

Match the columns

1.

(d)

(c)

(b)

(a)

2. B

3. A

4. D

5. C

6. B

7. B

8. C

9. B

10. A

11. C

12. A

13. B

14. B

15. Galapagos Islands

Biology

Unit 2 Assessment

Date: _____

Name: _____

Choose the correct answer.

1. Nutrition is:
 - a) Eating healthy food to grow strong.
 - b) The process through which necessary nutrients are obtained from food so that cells can perform vital functions.
 - c) The process from which living beings obtain food from the environment.
 - d) Just the ingestion of highly nutritious food.
2. Which is the body part or system in charge of nutrition in animals?
 - a) Circulatory system.
 - b) Nervous system.
 - c) Digestive system.
 - d) Respiratory system.
3. Proteins are formed by:
 - a) Lipids.
 - b) Monosaccharides.
 - c) Fat acids.
 - d) Amino acids.
4. The stages of nutrition are:
 - a) Diet, digestion, absorption, circulation, assimilation, elimination.
 - b) Diet and elimination.
 - c) Diet, and elimination of what we do not need.
 - d) Diet, digestion and assimilation.
5. "The Eatwell Plate" classifies food groups in:
 - a) Fruit and vegetables, cereals, legume and animal food.
 - b) Proteins, lipid, carbohydrates and animal food.
 - c) Fruit, vegetables, meat and junk food.
 - d) Healthy and junk food.

6. Which food is the main source of vitamins and minerals?
- a) Cereals.
 - b) Animal food.
 - c) Fruit and vegetables.
 - d) Dairy products.
7. Legume such as beans, green beans, lentils provide the diet with:
- a) Proteins.
 - b) Lipid.
 - c) Carbohydrates.
 - d) Protein and carbohydrates.
8. Which are the autotroph beings?
- a) The ones that feed from other organisms.
 - b) The ones that use solar energy or chemical substances to produce their own food.
 - c) The ones that make their own food from other food.
 - d) The ones that nourish from other living beings and solar energy.
9. In plants, in which part is light captured to perform photosynthesis?
- a) In the mitochondria.
 - b) In the chlorophyll of the chloroplasts.
 - c) In the nucleus.
 - d) In the cell membrane.
10. How are heterotrophs classified according to the food they diet?
- a) Herbivore, carnivore, omnivore, insectivore, detritivore.
 - b) Detritivore, herbivore, omnivore and insectivore.
 - c) Autotroph, herbivore, carnivore, and omnivore.
 - d) Autotroph living beings and detritivore.

11. Match the columns:

- | | |
|--|------------------------------|
| a) The pray has developed specific techniques, such as running away or attacking, developing horns, claws or spines to defend from predators. | () Mutualism. |
| b) Relationship predator-pray in which both species benefit. | () Chloroplast. |
| c) Relationship predator-pray in which one benefits damaging the other. | () Starch or carbohydrates. |
| d) Glucose is produced in photosynthesis and is stored in plants like: | () active defenses. |
| e) Plants get energy from the Sun in the _____ like chlorophyll (green), xanthophyll (yellow) and carotene (orange). | () Parasitism. |
| f) Cell organs in plants and algae that contain chlorophyll. | () Photosynthesis. |
| g) Physiological process carried out by plants and other phototrophic beings that when using sun light produce energy from water molecules and carbon dioxide. | () Photosynthetic pigments. |

12. Nutritional disease with which body mass is increased, there is excessive fat and overweight:

- a) Diabetes mellitus.
- b) Obesity.
- c) Anorexia.
- d) Bulimia.

13. Nutritional disease with which people feel fat, look themselves fat in front of the mirror even though they may be thin and neglect eating:

- a) Diabetes mellitus.
- b) Obesity.
- c) Anorexia.
- d) Bulimia.

14. Nutritional disease that consists of doing extensive fast, after consuming excessive food, feeling guilty and vomiting or taking laxative:

- a) Diabetes mellitus.
- b) Obesity.
- c) Anorexia.
- d) Bulimia.

Biology

Unit 2 Assessment Answer Key

1. B

2. C

3. D

4. A

5. A

6. C

7. D

8. B

9. B

10. A

11.

(4)

(1)

(5)

(3)

(7)

(2)

(6)

12. B

13. C

14. D

Biology

Unit 3 Assessment

Date: _____

Name: _____

Underline the correct answer:

- How are the respiration and nutrition processes related?
 - Cell breathing is the process through which nutrition and respiration processes are related.
 - Cells require oxygen to turn glucose into ATP, besides CO₂ and water.
 - When introducing CO₂ into the body, energy is produced.
 - Respiration and nutrition help cell growth.
- They are the organs that form the human respiratory system.
 - Nose or nasal cavity, lungs and trachea.
 - Nose or nasal cavity, pharynx, lungs and diaphragm.
 - Nose or nasal cavity, pharynx, larynx, trachea, bronchia, bronchiole, lungs, alveoli.
 - Nose or nasal cavity, pharynx, larynx, trachea, lungs, alveoli, diaphragm.
- Respiration is:
 - The aerial via process to take oxygen into the lungs during inhalation, make the gases exchange and eliminate carbon dioxide in the organism through exhalation.
 - Oxygen delivery to cells.
 - Oxygen inhalation and carbon dioxide exhalation.
- What is the name of the cells that transport oxygen in the human body?
 - White blood cells or lymphocytes.
 - Red blood cells or erythrocytes.
 - Osteocytes.
 - Plaques.
- Insects breathe through some tubing system in their bodies called:
 - Lungs.
 - Tracheas.
 - Gills.
 - Stomata.

6. Aquatic animals, such as fish, breathe through:
- a) Lungs.
 - b) Tracheas.
 - c) Gills.
 - d) Stomata.
7. Plants make a gas exchange through:
- a) Lungs.
 - b) Tracheas.
 - c) Gills.
 - d) Stomata.
8. Write three effects of global warming:
-
-
-
9. What is the name of the anatomic structure in the aerial via where voice is formed?
- a) Larynx.
 - b) Pharynx.
 - c) Trachea.
 - d) Oesophagus.
10. Route of the oxygen in the blood stream to reach cells and CO₂ to reach the lungs:
11. Which is the gas responsible for the greenhouse effect?
12. Mention three activities that represent an action that may stop global warming by increasing the air quality?
13. What is the process in which glucose is oxidized inside the mitochondria releasing energy?

Biology

Unit 3 Assessment Answer Key

1. B
2. C
3. A
4. B
5. B
6. C
7. D
8. Weather change, poles melting, drought, floods
9. A
10. Internal respiration
11. Carbon dioxide
12.
 1. Use of fuel that is not fossil fuel.
 2. Reduce the number of running cars.
 3. Reforest.
13. Cell respiration.

Biology

Unit 4 Assessment

Date: _____

Name: _____

Choose the correct answer.

1. What is reproduction?
 - a) It is the physical pleasure that is experimented through the senses related to sexuality.
 - b) The common function in living beings that makes reproduction possible to generate new individuals.
 - c) The period before maturity.
2. What is sexuality?
 - a) Human behavior that includes affective bonds, genre, reproduction and eroticism.
 - b) The way to form a couple.
 - c) Behaviour that involves sexual intercourse.
 - d) The way in which an individual interacts in society, and it includes the relationship with a couple, affective bonds and ability to produce offspring.
3. What is puberty?
 - a) The group of physical and behavior changes, proof that sexual maturity has been reached and that reproduction is possible.
 - b) Stage in which physical changes are produced due to hormone production.
 - c) Hormone changes that affect sexual organs to maintain a relationship.
 - d) Previous period before maturity.
4. What is menstruation?
 - a) When after ovulation fertilization occurs.
 - b) The release of the uterus lining when an egg is not fertilized.
 - c) Stimuli to the mamarian glands.
 - d) The release of the uterus lining when a spermatozoid fertilizes an egg.

5. Write the appropriate word in the blanks

1. Meiosis 2. Gonads 3. mitosis
4. sexual reproduction 5. Gametes 6. Budding

- a) They are the sexual cells. In all male they are called spermatozoids and in all female they are called eggs: _____
- b) Cell division that occurs when gamete cells are produced: _____
- c) Asexual reproduction in which genetic material is divided into two identical cells: _____
- d) Reproductive process in which new individuals grow from shoots or buds that are formed and fall from an individual: _____
- e) In animals and humans, sexual cells production occurs in organs called: _____
- f) Type of reproduction in which cells from two individuals make a new individual: _____

6. Which is the word to refer to physical characteristics, inherited by parents that can be perceived? _____

7. Which part in DNA is the one that contains the genetic information?

8. Cell division in which other cells are formed to make tissue and organs:

9. _____ are all the cells in the body that are not gametes.

10. Write "a" or "b" depending on the case:

- a) Temporary birth control
b) Permanent birth control

Intra uteral device. ____

Bilateral tubal occlusion. ____

Condom. ____

Vasectomy. ____

Oral Hormones. ____

Biology

Unit 4 Assessment Answer Key

1. B
2. A
3. A
4. B
5.
 - a) Gametes
 - b) Meiosis
 - c) Mitosis
 - d) Budding
 - e) Gonads
 - f) Sexual reproduction
6. Phenotype
7. Chromosome
8. Haploid
9. Somatic cells
10.
 - a
 - b
 - a
 - b
 - a

Biology

Unit 5 Assessment

Date: _____

Name: _____

Circle the correct answer.

1. What is the objective of doing projects?
 - a) Spend the rest of the course time.
 - b) Check the students' advance and acquired abilities to develop topics of the course, so that knowledge can be integrated and applied.
 - c) Identify a problem and solve it.
 - d) Test results through experimentation.
2. How are project topics chosen?
 - a) Looking for the simplest topics.
 - b) Choosing the topics that are interesting to students.
 - c) Letting the teacher decide them.
 - d) At random.
3. Which are the abilities and knowledge to do a project correctly?
 - a) Scientific knowledge.
 - b) Creativity, imagination, decision-taking ability, develop an opinion to carry it out.
 - c) Different language knowledge.
 - d) Both a and b are correct.
4. Why is collaborative work important to do a project?
 - a) Because when team working, a democratic attitude in which everyone participates and work load is balanced, is developed.
 - b) Because if the most dedicated student does the most important part, the result will be correct.
 - c) When in a team everyone wants to decide and take decisions, leading the team is more fun.
 - d) Because if you leave the hardest part to your classmates, you can take a rest.
5. What method should be used to do a project?
 - a) The empirical method.
 - b) The scientific method.

- c) The analytical method.
 - d) Both answers a and b are correct.
6. Which are the steps to develop a project?
- a) Plan, research, delivery and evaluation.
 - b) Plan, research and results analysis.
 - c) Make questions about the topic and communicate.
 - d) Plan, delivery and evaluation.
7. It is a project that describes and explains every day, natural phenomena through research, in which students can develop activities related to formal scientific work:
- a) Collaborative project.
 - b) Scientific project.
 - c) Social project.
 - d) Technological project.
8. They are projects that contribute to evaluate critically science and society through interaction between students and other people as well as through the analysis of problems and social situations, interesting to students.
- a) Collaborative project.
 - b) Scientific project.
 - c) Social project.
 - d) Technological project.
9. Projects that stimulate creativity to build technical objects and boost practical mastery related to materials and tools to simplify tasks:
- a) Collaborative project.
 - b) Scientific project.
 - c) Social project.
 - d) Technological project.
10. Projects in which students get together, make an effort, cooperate and coordinate to reach the desired outcome:
- a) Collaborative project.
 - b) Scientific project.
 - c) Social project.
 - d) Technological project.
11. Knowledge obtained through experience and observation whose results have not been tested:
- a) Scientific knowledge.

- b) Empirical knowledge.
 - c) Moral knowledge.
 - d) Theoretical knowledge.
12. Knowledge which is obtained through a scientific method in which an organized procedure, that starts in observation, moves on to research, then to experiment and finally to analyse data in order to explain nature's phenomena, concluding whether it is true or not is followed.
- a) Scientific knowledge.
 - b) Empirical knowledge.
 - c) Moral knowledge.
 - d) Theoretical knowledge.
13. Rank the scientific method steps:
- () Make questions about the topic or the hypothesis.
 - () Results delivery.
 - () Do research thoroughly.
 - () Object or phenomenon observation.
 - () Analyse results creating a conclusion and postulate theories and laws.
 - () Experiment.
 - () Choose a topic.
14. Which is the first step when you do a research project?
- a) Deliver conclusions.
 - b) Observe the object or phenomenon.
 - c) Choose a topic and make questions about it.
 - d) Do research from different sources.
15. They are the sources from which information might be collected.
- a) Action movies.
 - b) Internet, encyclopedias, books, magazines, etc.
 - c) Interviewing specialists in the topic.
 - d) Both answers b and c are correct.

Biology

Unit 5 Assessment Answer Key

1. B
2. B
3. B
4. A
5. D
6. A
7. B
8. C
9. D
10. A
11. B
12. A
13. 2, 6, 4, 3, 7, 5, 1
14. C
15. D

Projects Rubrics

Aspect	Beginner	In process	Expert
Theoretical framework	The introduction is weak or there are major inaccurate aspects.	The introduction does not fit with the rest of the project or there are minor inaccurate aspects.	The introduction provides with accurate and relevant information.
Project evidence	The project has inaccurate data. It is irrelevant or repetitive and it contains questionable evidence.	The project has minor errors or it is not very elaborated.	The project is clearly explained.
Project design and performance	The variables are not controlled. The study object is not focused. There's a lack of data.	Some variables are controlled. The study object is focused. The data has mistakes.	The variables are under control. The study object is clearly focused. There are few data mistakes.
Conclusion	There is not a conclusion or it is not sustained.	There is a conclusion, but it is weakly sustained.	The conclusion is well sustained.
References	The reference list contains one or two sources but the references are incomplete.	The reference list contains three sources with complete references.	The reference list contains four or more sources with complete references.
Language use	The project is not very clear. It lacks organization, coherency or appropriate grammar use.	The project is clear, with a few flaws on organization, coherency or appropriate grammar use.	The project is coherently described and clearly stated with few grammar and spelling mistakes.
Collaborative work	Not all the members of the team presented or participated.	Some of the members of the team presented or participated.	All the members of the team presented or participated.

Resources list

Unit 1		
Student book page:	Topic	Resources
11	In the lab	Paper towel, beans, a glass jar
13	Food Chains	Cardboard, images of plants and animals Markers, scissors, glue stick
15	Evolution	Microphone, TV camera, Charles Darwin costume, Nicolas Steno costume
20	In the lab	Seeds, cardboard
22	Medicinal plants	Paper, medicinal herbs
25	In the lab	Cover clips, dropper, observation materials
27	Causes of microbial diseases	Cardboard, markers, ruler
Unit 2		
37	Benefits of having a vast variety of Mexican food	A dish that is made with one of the following ingredients: fish, seafood, corn, prickly pears (nopales), chili, avocado, coffee to make a gastronomy exhibit.
45	In the lab	A net to hunt flying insects, a large lidded jar, alcohol, a magnifying glass
47	Autotrophic and Heterotrophic organisms	A large, empty, pet bottle, soil, a plant and a couple of insects
51	Fertilizers and pesticides in Mexico	Two corns: One with small teeth the other with large ones. (In teams) a governor, a farmer, a retail storeowner, a consumer, a ruck driver, a chemistry engineer and the president costume.
Unit 3		
60	Respiratory system	Poster of respiratory system
62	In the lab	A transparent water glass, lime water or bromothymol blue substance, straw
68	Adaptations	Cardboard, ruler, markers

69	Adaptations	An insect, a lizard, a fish, a plant in teams, they should get one of each one.
72	Hands on	Two lab thermometers, a glass jar with a tight fitting cap and a straw hole, another glass but without a cap.
75	Analyzing technological advances on	Costumes of Ian Fleming, Howard Walter Florey, Robert Koch and Wilhelm Rontgen to perform another TV show. Microphone, TV camera.
Unit 4		
93	Reproductive health	An egg, paper to decorate it
99	In the lab	Fern plants, white sheet of paper, clear container
102	In the lab	Microscope, cover slip, scissors, dissection needle, forceps to hold hot objects, dissection forceps, toothpicks, filter paper, a medium size glass, watch glass, aceto-orcein solution.

Biology

Attendance and Evaluation List

School: _____ School year: _____ Teacher: _____

Student's name	Unit attendance																Sequences grades					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						

Biology

Attendance and Evaluation List

School: _____ School year: _____ Teacher: _____

Student's name	Unit attendance														Sequences grades			Unit Project	Unit grade
	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48			

Extra Dynamics

Dynamics help a lot to understand concepts when they are productively designed. The key to deliver a productive class is keeping in mind the aim of the sequence or lesson, your students' needs and the available time. As long as you do not lose track of your class aim, the dynamics will help students grasp knowledge and you deliver content.

Unit 1

1. **“Evolution” broken telephone.** (Game to understand how adaptations occur due to external factors. Time: 10 minutes). This game can be used either at the beginning of the sequence regarding evolution or after the first session, once the first information delivery has been completed.

Prepare a small set of instructions to create the perfect dog. Tell the instructions to a student. Students should pass on the message from one to another until the last student in the class writes the instructions on the board. Once the last student writes the instructions on the board, show them the instructions you first gave.

Have them see how much the instructions changed by asking them: How long did it take to (the last student's name) to get the instructions? How much did they change? Why did the instructions change? So, would I get my perfect dog, with the instructions that (the last person's name) wrote? Explain: That is why adaptation changes creatures. According to the environment.

2. **Creating the ideal species.** (Dynamic to understand how adaptations occur due to the context. Time: 15 to 20 minutes). This game can be used once you have discussed about adaptations. It can be used as the lesson opener to help students predict the topic or as an application, to teach them how adaptations are done.

Prepare cards with different environment descriptions; that is, climate, topography, food, etc.) For every team you will form. Ask students to work in teams of four. They first should choose their favorite animal and so as not to repeat, even their favorite breed (if it were the case with three teams choosing a dog or other common animal).

Tell them, they should create the perfect animal or breed adapted to survive according to the environment you described on the cards you gave them. Give them time to draw and prepare the adaptations their animal needs. Each team should present their ideal species. Finally, help them see that the best species is the one that would best adapt to the environment.

3. **Mexican medicinal plants garden.** (Dynamic to grow students' care for common property as well as get familiar with medicinal plants. Time: 30 to set it, the rest of the school year to care for it).

Assign one different plant to each student in your group. Each person should bring a different medicinal plant to class in a pot. They will keep a garden in the classroom where you will roll turns to water, and care for the plants for the rest of the school year. In the end of the school year, they will take the plant back home.

4. **Cell model.** (Extra project to help kinesthetic students understand the parts of the cell. Time: 30 to 40 minutes).

In teams of four or five, students should make a 3D cell model with plasticine, fabric, resilient foam or any other material they choose labeling each part.

Unit 2

- 1. The healthy plate.** (Activity for students to create their own healthy plate. Time: 20 to 30 minutes).

Students should check: <http://ndb.nal.usda.gov/ndb/foods>. In teams of four, they should create a 1600-calory diet. Checking the list to find out nutritious value and form the menu they best prefer. Then, the following session, they should present their menu with the suggested portions and presentation.

- 2. Identifying autotrophic and heterotrophic organisms.** (Activity to see which the main differences are between these two kinds of organisms. Time: 5 minutes).

Prepare pictures of the following organisms:

- The resurrection fern.
- The corpse lily.
- Living rocks.
- Venus fly traps.
- Ball moss.
- Algae autotrophs.
- Green algae.
- Red algae.
- Locusts.
- Cows.
- Wolves.
- Hawk.
- Sharks.

And any other example you would like to add. Set the pictures around the classroom and ask students to take a picture, carefully describe the organism and organize them in autotrophic or heterotrophic. As a follow up activity, students might make masks of their favorite organism (from the ones they chose). Then, one by one, they introduce themselves and the class should say whether they are autotrophs or heterotrophs and why.

- 3. Healthy food Stop.** (To help them remember key vocabulary. Time: 10 to 15 minutes).

Students should divide their notebooks into six categories: Mexican dishes, American dishes, Italian dishes, fruit, vegetables and foods to avoid. You will tell them a letter of the alphabet and they will have to write the name of a food or dish. Once they finish, elicit for examples and they should tell whether it is healthy or unhealthy and why.

Unit 3

- 1. Meditation in class.** (Activity to understand the importance of breathing; typically used to calm students down. Time: 5 to 10 minutes). Explain that good breathing is something important and that they will be studying about the respiratory system.

Students should sit down with straight back, straight legs, free arms and their hands on their lap. Ask students to take a deep breath counting four and exhaling counting to seven. Repeat the exercise three times. Then, students should close their eyes.

Once they close their eyes, they will repeat the breathing exercise other three to five times. Tell them then the following instructions:

- a. Imagine you leave the classroom and float outside. Go to your favorite place.
 - b. Start walking. Pay attention to your breathing. Do not forget to keep on breathing counting to four and exhaling counting to seven. Imagine the air, the floor, the landscape. Are you alone? Is there anybody else with you? (Give 10 to 20 seconds).
 - c. It's time to go back. Say goodbye to that place and get back to school. (Give them time to imagine their return). Now, open your eyes. Share with a classmate how your imaginary trip was.
- 2. Emphysema model.** (Project to understand how emphysema destroys the lungs. Time: In class, 2 to 3 minutes).

Students should paste on a paper pieces of soup (yes, like in pre-school) on a drawn model of the lungs at home. The following day, they should take other classmate's model and remove as many pieces of soup as they can, little by little. Explain that it is exactly what happens in the lungs with the cigarette. Every time people smoke, the cigarette destroys little pieces of the lung until the smoker cannot breath anymore.

- 3. Health campaign to prevent respiratory diseases.** (To boost community service. Time: in class: 1 session. For the presentation: 1 session).

Organize six teams. Each team will make one of the following projects: posters, a song, a commercial, a podcast, flyers and a mini-play to give a presentation in a common room, to all other groups in the school about respiratory diseases. What each disease is, (Cold, influenza, bronchitis, pneumonia) and how to prevent them.

Unit 4

- 1. Responsible sexuality.** (Activity to lead a discussion on consequences of irresponsible sexuality handling and how to prevent it. Time: 30 to 40 minutes).

Search for a video depicting the story of a teen couple that is having a baby. It should take 10 to 15 minutes the most. Then, students should discuss what they would do in the story. Would they take the same decisions? Is it ok with them to have a baby? Why or why not? What should they do?

- 2. Comparative analysis of some reproduction adaptations.** (Activity to enrich how reproduction adaptations have changed organisms. Time: 30 minutes to do research, the video should be assigned for homework).

Students should be divided into five or six teams. Each team will be assigned one different kind of living organism. (Include sexual and asexual beings). Then, they should do research to find out how each specific species reproduces. Finally, they will make a video explaining how it happens and will present it in class.

3. Discussion on genetic manipulation. (Activity to understand how genetic manipulation works. Time: 5 to 7 minutes).

In teams, students should get a jenga game. Ask them to build up a tower. When they finish it, they should test it. Then, give them large pieces of lego (for pre-school). And substitute just some pieces in the tower. What happened? Was the tower firm and well-built? That is what happens in genetic manipulation. Lead a discussion: Is it ok to modify the instructions of organisms? Why or why not?

Biology is a practical text that helps to enjoy, understand and experience science as you work on experiments, reflection, research and collaborative work while learning English in written and oral tasks.

Biology Teacher's Guide offers strategies to develop language and learning skills so as to assist the teacher delivering content to students in an approachable, fun way.

