Module for B.Ed Early Childhood Education Programme

EBS264SW:
SCIENCE ACTIVITIES FOR EARLY CHILDHOOD EDUCATION

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UNIT 1: SCIENCE IN THE ENVIRONMENT

Dear learner, you are welcome to unit one of 'Science Activity for Early Childhood Education'. This unit— Science in the Environment— will take you through some basic natural occurrences in the environment as well as our response to the environment. We are about to take a journey from the seasons we observe, and through the light that enables us to see. Instead of adding to this beautiful world, mankind through our activities makes it bad by adding harmful substances to it. This is the concept of pollution that we will consider in this unit too. Expect a very safe landing on what we can do by way of cleaning and tidying to restore this sinking nature. Stay with me as we journey together.

Learning outcome(s)

By the time you finish reading through all the sessions of unit one thoroughly, you should be able to:

- explain what Seasons are and how they affect land, sea, and atmosphere;
- identify sources of light and explain the concept of shadow formation;
- explain what environmental pollution is and know the various types of environmental pollution;
- identify how cleaning and tidying can be appropriate responses to the sanitation situation in the environment

SESSION 1: THE SEASONS: LAND, SEA, AND ATMOSPHERE

The seasons can bring a wide variety to the year for those locations that experience them in full. The weather in each one may allow people to engage in activities that they cannot perform in others. For example, outdoor programmes and drying of farm produce are mostly done during the dry season and not the rainy season. Each season brings with it its own potential dangers such as the prevalence of some diseases like Cerebrospinal meningitis (CSM) during the dry season in certain parts of Ghana, but also its own particular brand of beauty. In this session, we shall look at what season is. We shall discuss the causes, types, and effects of seasons on the land, sea, and atmosphere.

Learning outcomes

By the time you fully go through this session, you will be able to clearly:

- describe what seasons are;
- identify the various types of seasons on earth;
- discuss the effect of seasons on land, sea, and atmosphere.

What is a Season?

Seasons are a very important element in our lives. They have an influence on what we wear, what we eat, and what we do in our free time. Can you think about how seasons affect what you wear, eat and do? A season is a period of the year that is distinguished by special climate conditions based on changes in weather, ecology, and the number of daylight hours in each region. Did you just take note of three factors that contribute to seasonal changes? In popular culture, seasons are often divided by calendar dates irrespective of weather and other deciding factors. On Earth, seasons are the result of the Earth's orbit around the Sun and Earth's axial tilt relative to the ecliptic plane. In temperate and Polar Regions, the seasons are marked by changes in the intensity of sunlight that reaches the Earth's surface, variations of which may cause animals to undergo hibernation or to migrate, and plants to be

dormant. The timing and characteristics of the seasons depend upon the location on Earth. Regions near the equator experience fairly constant temperatures throughout the year. This is because it gets fairly constant light from the sun, due to its position on the outer curve of the Earth. For areas to the north and south, the seasons can change more significantly. People closer to the poles might experience icier, more cold winters, while those closer to the equator might suffer hotter summers. Indeed, the earth's orbit is not a perfect circle. It is a bit lop-sided. During part of the year, the earth is closer to the Sun than at other times. However, in the Northern Hemisphere, we are having winter when Earth is closest to the Sun and summer when it is farthest away.

Types of Seasons

In Ghana and some other parts of the world, we experience two main types of seasons. These are the dry and wet seasons. However, in other parts of the world, there are four seasons. These are spring, summer, autumn, and winter which follow one another regularly. Each has its own light, temperature, and weather patterns that repeat yearly.

- **Spring:** The spring season is a time of renewal. During this time, trees begin to develop (bud) and flowers start to bloom. Rainy days make it easy for plants, flowers, and grass to grow.

- **Summer:** Summer is a common season for thunderstorms. When the earth tilts towards the Sun, we get more heat. Everybody loves the summer. Plants are in full bloom and the smell of freshly cut grass fills the air.

- **Autumn:** This season is also called 'Fall' because, during this time, leaves fall from their trees. It brings colder temperatures and frost. Some crops are harvested during autumn. Corn is one of them. Animals prepare for hibernation (think of it as a period of hiding or minimal action) during this season by eating a lot as they need to save fat and energy for the harsh winter months.

- **Winter:** The winter season brings snow and ice to a lot of locations around the world. Most animals go into hibernation during this season. Such animals include bats, snakes, bears, skunks, etc. Seasons are clearly distinct in temperate zones. The equatorial regions do not have very noticeable seasonal changes. This explains why I mentioned at the beginning that Ghana and some other countries have only two alternating types of seasons, Wet/rainy season and Dry season.

But what causes those changes at all? Please stay with me as I share with you, the backstage work!

Why do the Seasons Change on Earth?

Two things cause the seasons to change. First, the earth moves around the sun. Second, the Earth has a tilted axis of rotation. The earth spins around an axis. This imaginary line extends from the South Pole to the North Pole. But the earth's axis is not vertical. It's tilted at an angle of 23.5°. What does the Earth's tilted axis have to do with seasons? It means that different parts of the planet are tilted toward the Sun at different times of the year. It's also why the seasons are different in different parts of the world. Not all parts of the earth have four distinct seasons. But they all experience seasonal variation. Closer to the North Pole and the South Pole, daylight and temperatures change with the seasons. Days are longer in summer than in winter whereas temperatures are colder in winter than in

summer. Near the equator, days are always about 12 hours long, and these areas usually have a wet season and a dry season.

The effect of seasons on land, sea, and atmosphere

When a meteorologist is predicting high-pressure conditions during summer, you often can expect sunny weather and feeble winds. During the winter, the same high pressure could cause a whole day of cloudy and misty conditions. This may sound confusing, but by understanding the role of seasonal variations you can better understand the uncertainties in the forecasts. As the axis of the Earth's rotation is tilted 23.5 degrees relative to its orbit around the Sun, there will be seasonal changes during the year as the Earth is moving around the Sun. During the summer, the Northern Hemisphere will tilt towards the Sun resulting in more direct sun radiation and higher temperatures. During the winter, the Northern Hemisphere is tilting away from the Sun with less direct sun radiation as a result and the temperature will therefore lower (See Figure 1).

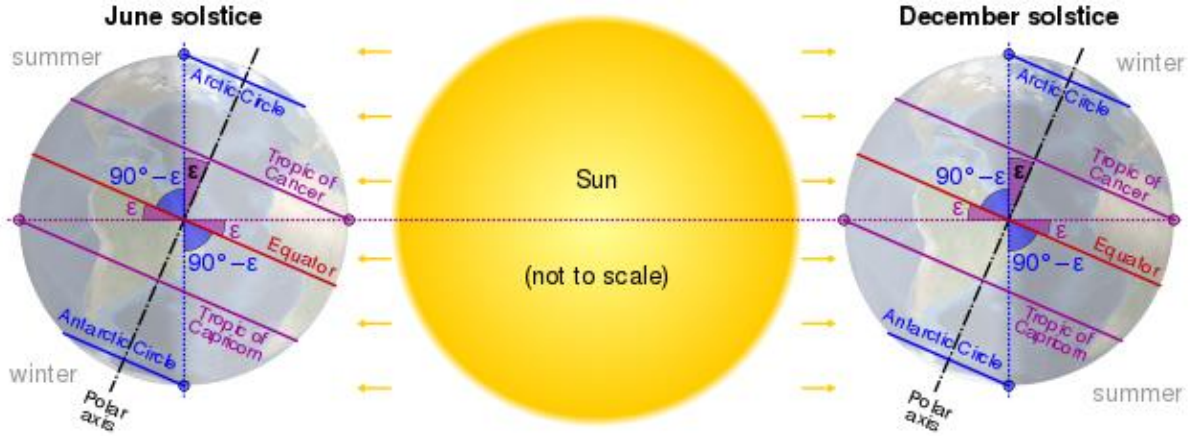

Figure 1: Summer and winter due to the tilt of Earth's axis. Source: Wikipedia

The warmest and coldest temperatures will be observed somewhat later than the Sun's maximum and minimum due to the cumulative effect of the Sun's heating of the Earth's atmosphere and especially the heating of the seas and oceans. The tilt of the Earth, and hence the amount of radiation from the Sun, will also affect the local weather. When high pressure is located over an area, it will result in weak winds and often dry conditions. However, depending on the type of air mass, moisture may be trapped near the surface during the night due to a stable vertical temperature profile and no significant mixing with layers above. This can often cause mist/fog and low-stratus clouds. During the summer, the fog/mist/low clouds will typically disappear during the morning (some hours after sunrise). The difference in temperature between land and sea also plays an important role in the local weather due to the heat capacity of seawater. Showers are more common over land during the summer, while the opposite is true for the (early) winter when the water is relatively warm. The presence of fog will also differ between land and sea depending on the season. The weather is different during each season. As the weather changes, plants change too, and animals change their behaviours to suit the weather conditions. For instance, in spring the weather begins warmer. This session has helped you to understand what is meant by seasons. We have gone through the various seasonal changes and described the various types of seasons. And at the end of the session, the effects of seasons on land, sea, and atmosphere were described.

Key Ideas

- A season is a period of the year that is distinguished by special climate conditions
- The types of seasons a country experiences are determined by the location of that country with respect to the equator
- The rotation of the earth and its movement around the sun cause seasonal changes
- The changing patterns of the weather result in changes in the behaviour of organisms

Reflection

- As a teacher, why is it necessary to study the seasons in your country?
- Why should children in early childhood be aware of weather and seasonal changes?
- How has your knowledge of seasonal changes affected your view about the behaviour of other people and organisms in your area and other parts of the world?

Discussion

- What are the kinds of seasons in Ghana?
- What are the differences between our seasons and countries in the temperate regions of the world?
- What causes the changes in seasons around the world?
- What are the effects of the seasonal changes on the land, sea, and atmosphere?

SESSION 2: LIGHT ENERGY: NATURE, SOURCES, AND SHADOW FORMATION

In the previous session, we mentioned that seasons are characterized by certain amounts of sunlight that determine the length of the day and of the night in each part of the world. In this session, we turn our attention more to the nature of light, its sources, and the formation of shadows resulting from blocked light rays. Stay with me.

Learning outcomes:

By the end of this session, I expect you to be able to;

- describe what light is;
- identify the various sources of light;
- explain how shadows are formed;
- identify the benefit of the reflection of light on the surface.

Light as a form of energy

What do you try to look out for, the moment you enter a dark room? Have you ever wondered why electricians position the light switches/keys so close to the doors? You need a source of light to be able to see an object. In the open places, you depend on the sun during the day to be able to see. At night, artificial sources and some living organisms like fireflies enable you to see objects. The objects we see either produce light on their own or reflect light from other sources. You can also detect light with your light. Light is the form of energy that enables us to see objects.

Sources of Light

An object which gives out light is called a source of light. The various sources of light around us are the sun, stars, electric bulbs, tube lights, kerosene oil lamps, candles, torches, fireflies, etc. These sources can be grouped into two: natural and artificial/man-made.

- **Natural sources of light:** this is the source of light that occurs in nature. For example, the sun, stars, meteors, glow-worms, and fireflies.
- **Man-made source of light:** these are the sources of light that have been made by man. For example, electric bulbs, tube lights, kerosene oil lamps, candles, and torches.

Luminous and non-luminous objects

An object which gives out its own light is called a luminous object. For example, the sun, stars, burning candles, electric bulbs, television screens, the flames of a gas burner, fireflies, etc. Since luminous objects give out their own light, they can be seen even in the dark. An object which does not give out light is called a non-luminous object. For example, tables, chairs, books, pens, erasers, and many more. However, these objects can be seen only when the light coming from a luminous object falls on them. When this reflected light enters the eyes, we can see the non-luminous objects. For instance, a moon is a non-luminous object. We can see the moon because it reflects sunlight into our eyes. When sunlight falls on the surface of the moon, then some of this light sunlight is reflected by the moon towards the earth. And to us, it appears as if the light is being given out by the moon itself. We can see the table because it reflects the light falling on it in all directions. And when this reflected light coming from the table enters our eyes, we can see.

Transparent, Translucent, and Opaque Materials

Different types of materials transmit light differently. Based on the way they transmit light, materials can be divided into transparent, translucent, and opaque.

Transparent Materials:

These are materials that allow light to pass through them and also allow objects to be seen through clearly. Examples of transparent materials are clear air, clear glass, clean water, some kinds of plastic, and cellophane paper.

Figure 2.1: Transparent objects

Can you see the tomatoes in the plastic container? How can you describe the container from the discussion above?

Translucent Materials:
These are materials that allow light to pass through them, but scatter or diffuse the light as it passes through, i.e., a parallel beam of light comes through in all directions. That is why an object cannot be seen clearly through translucent materials. Examples of translucent materials are butter paper, frosted glass, paper smeared with oil, and smoked glass

Figure 2.2: Translucent objects
Some of the tomatoes are in the bowl on the dining table. Can you see them clearly?

Opaque Materials:
Materials that completely block light are called opaque materials. We will not be able to see through these materials at all. Examples of opaque materials are metal, mud, cement, coal, and wood. A mirror is a very good example of opaque material. An ideal mirror does not let any light pass through it.

Figure 2.3: Opaque objects
I have put the tomatoes in the bowl on the table, but they cannot be seen.

Activity:
Ask your pupils to list the objects they see in the classroom.
Guide them to group them into transparent, translucent, and opaque objects

Propagation of Light

Usually light travels in a straight line. A ray is a path taken by light. When we want to represent the propagation of light with a diagram, we represent a ray by a line with an arrow that shows the direction of propagation of light, and such a diagram is called a ray diagram. A group of light rays moving in an organized manner is called a beam of light. It can be a group of rays parallel to each other (parallel beam), scattering from a point source (divergent beam), or meeting at a point (converging beam).

Figure 2.4: A ray of light

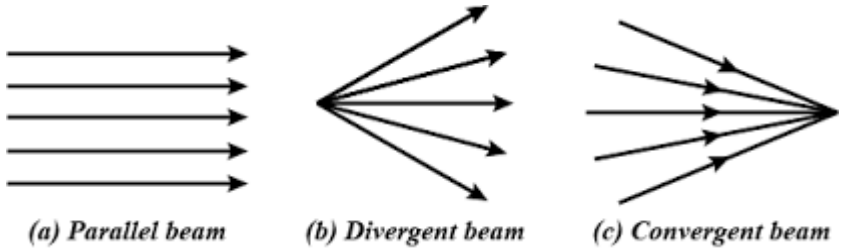

Figure 2.5: Types of beams

Next time you hear the school bell for all students to gather at a particular place, remember the converging beam. At the parade, 'form straight lines', should remind you of the parallel beam and when finally, you are instructed to 'dismiss', there you go, remember divergent/scattered beam ok?

Light travels in straight lines. This phenomenon is what is known as the rectilinear propagation of light. The property of light to travel in straight lines explains many interesting phenomena related to light. This includes the formation of shadows (for instance, in the formation of eclipses) as well as the pin-hole camera. Go with me as we briefly look at them.

Shadows

An opaque object can be placed in the way of a beam of light, blocking it. This creates an area of darkness on the other side of the object. A translucent object also creates a faint area of darkness. An area of darkness formed by an opaque object obstructing light is called a shadow. The following three things are required for a shadow to form:

- A source of light
- an opaque object
- a screen or surface behind the object.

A shadow will not form if any of these is absent. This explains why we cannot see a shadow in the dark. It is only when light rays are obstructed by an opaque object that we get a shadow of the object.

Figure 2.6: Formation of shadows

Have you seen the shadow of the bowl in which I put the tomatoes? If light rays could bend around it, we wouldn't see the shadow.

Characteristics of a Shadow

A shadow has the following three characteristics:

- It is always black/dark, regardless of the colour of the object used to make the shadow
- It only shows the shape or outline of the object and not the details.
- The size of a shadow varies depending on the distance between the object and the source of light, and the distance between the object and the screen.

Formation of eclipses

In the diagram below, you can observe that the sun's rays are blocked from reaching part of the earth either totally or partially. This is because the rays of light which cannot pass through the opaque moon, cannot bend around it either. They pass through straight lines which we just mentioned. This result in two regions of darkness on the earth's surface facing the sun: the region of partial darkness called the penumbra and the region of total darkness, referred to as the umbra region.

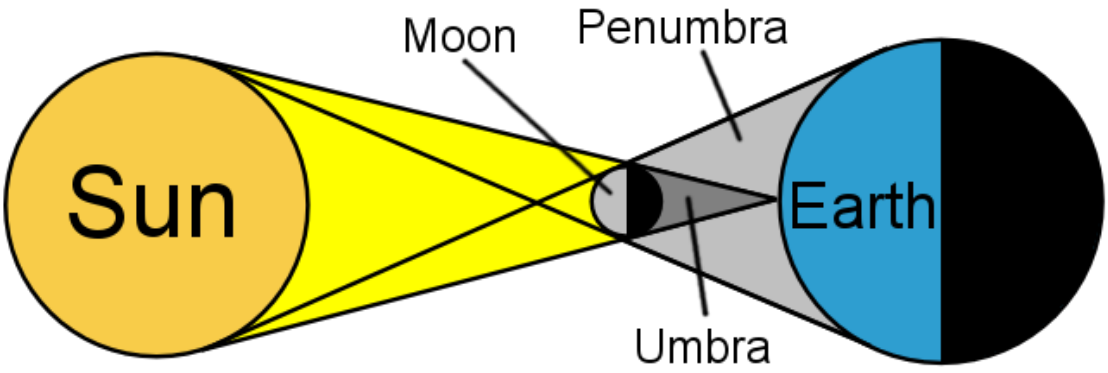

Figure 2.7: Formation of eclipse of the sun

The pin-hole camera

The pin-hole camera also operates with the principle of rectilinear propagation of light. A pin-hole camera is just a box with a very tiny hole on one of its sides. Think of it as a camera with a hole as small as that of a pin. Light falls on the hole, and an inverted image is formed on the side opposite to the hole. The human eye acts very much like a pin-hole camera.

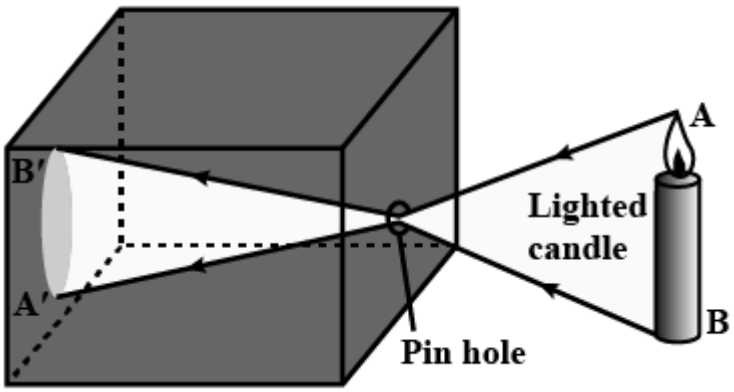

Figure 2.8: Image formation in a pin-hole camera

Activity: Demonstrating the principle of rectilinear propagation of light in the classroom

Things needed: 3 pieces of cardboard of equal sizes, nail/pin, a flat surface, a candle stick.

Procedure:

1. Place the pieces of cardboards on top of each other.
2. Make a hole through all of them using the nail/pin.
3. Position them on the lab table a short distance from each other.
4. Light the candle and place it on one side of the cardboards.
5. Stand on the other side of the cardboards and observe the rays of light.
6. Disturb the position of one of the cardboards and observe again.

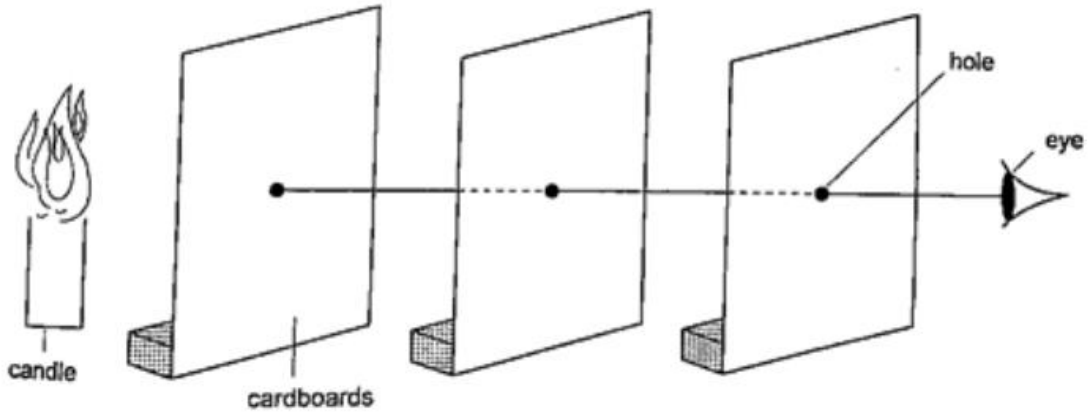

Figure 2.9: experiment to demonstrate rectilinear propagation of light

Did you see the rays of light from the candle after you set up? I hope so.

What were your observations when you slightly shifted one of the cardboards? Could the rays of light bend around it so you could still see? Certainly not!
Observations: The ray of light could be seen only when the cardboards were aligned.
What conclusion can you draw from the experiment?
Conclusion: Rays of light travel on straight lines

Reflection Surfaces

We say light is reflected when it bounces off a surface. Reflection of light helps us to see most of the things around us. The reflection of light by a surface depends on the nature of the surface. A rough and bumpy surface (also called an irregular surface) reflects a parallel beam of light incident upon it in different directions

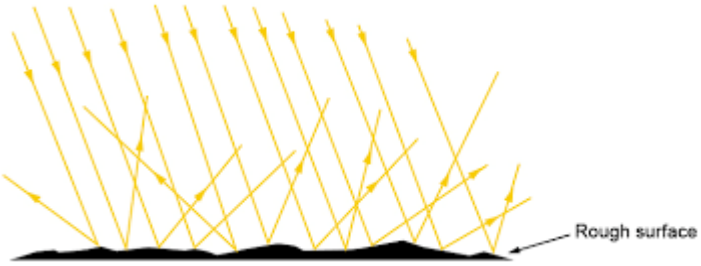

Figure 2.10: reflection on a rough surface

Reflection from a rough surface (irregular/scattered/diffused reflection)

A good example of a rough surface is the bark of a tree and blanket. This kind of reflection is called diffused reflection. A smooth surface (a highly polished surface) reflects a parallel beam of light incident upon it in one direction.

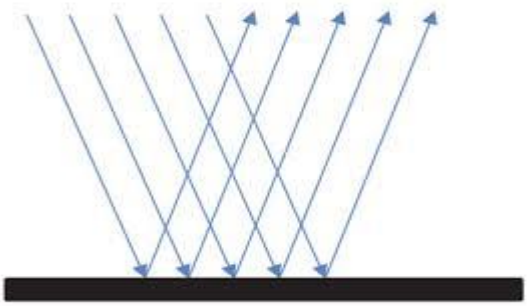

Figure 2.11: reflection on a smooth surface

Reflection from a smooth surface (regular reflection)

A good example of a smooth surface is a mirror. When you stand in front of a mirror, you can see yourself in the mirror. This is called your image.

Reflection from a smooth surface

A very interesting phenomenon occurs when an object forms an image by reflection. This is something all of us must have noticed while seeing ourselves in the mirror. When we lift our right hand, the image in the mirror appears to lift its left hand. This seeming left-right reversal is called lateral inversion. An image is different from a shadow. Some of the differences between an image and a shadow are given in

Table 2 Differences between the image and the shadow of an object

Image	Shadow
It has the colour of the object	It is always black, regardless of the colour of the object.
It gives the details as well as the outline of the object.	It gives only the outline of the object.
It undergoes lateral inversion (that is left-right reversal).	The appearance of the shadow is the same as that of the object from which it was formed without tilting sideways.

Key Ideas

- Light is a form of energy that enables vision
- Light can be received from natural or artificial sources
- Reflection is the bouncing of a ray of light when it hits a surface
- A shadow is formed when an opaque object is placed in between a source of light and a screen
- The formation of shadows and the operation of the pin-hole camera are due to the principle of rectilinear propagation of light.

Reflection

This session helped you to understand what light is. It further described the various sources of light. At the end of the discussion, the session further explains the formation of shadow and the reflection surface of light.

Scenario: You were walking outside in the late evening with a six-year-old child when the moon's reflected light from the sun displays your shadows right behind you. The child, fearing that another man was chasing you screams. How would you explain away his fear so he could appreciate shadow formation as an everyday scientific phenomenon around us?

Discussion

- How different is a luminous source of flight from a non-luminous one?
- In your own words, describe how eclipses are formed.
- Identify any four sources of light that the kindergarten child is familiar with.

SESSION 3: ENVIRONMENTAL POLLUTION

In the previous session, we looked at some scientific phenomena that happen around us. We discussed the seasons and then light. In the next two sessions, we seek to discuss our response as humans who have been entrusted with the responsibility of taking care of our environment. It is unfortunate to note that some people's actions or inactions result in the release of harmful substances into the environment. This is called pollution. The result is that everyone in the world stands to suffer from those actions. Our discussion will focus on the meaning, causes, types, effects, and solutions to environmental pollution.

Come with me as we study it together.

Learning outcomes:
By the end of this Session, students should be able to;

- Explain what is meant by environmental pollution.
- Identify and explain the types, causes and effects of environmental pollution.
- Outline measures to prevent environmental pollution

What is Pollution?
A quality environment is important for the well-being of the populace. For the populace to be at its optimum health level the environment must be healthy itself. Any undesirable change in the environment that can be harmful to humans and other forms of life is known as pollution. Simply put, pollution is the introduction of harmful substances into the environment. It is the release of waste substances or energy into the environment in quantities that are harmful to human beings or to other living things, or that in some way reduce the quality of human life. It becomes necessary then to treat substances that are being introduced into the environment so that they are no longer dangerous to life. Pollutants are substances added to the environment, particularly by human activities that lead to undesirable effects for all living things. Human beings add pollutants to all parts of the biosphere – air, water, and land.

Types of Environmental Pollution
Pollution can be classified based on the type of pollutant, its source, and its occurrence. For our purpose we shall focus on the following types of pollution:

- Water pollution
- Land pollution
- Air pollution
- Noise pollution

Water pollution
This type of pollution refers to the release of harmful substances to water bodies that bring changes that are harmful to living organisms that are connected to these water bodies. It reduces the quality of water that is used by plants, animals, and human beings for several purposes. Pollution of rivers, streams, lakes, ponds, and the sea is mainly caused by the discharge of untreated sewage and waste material from factories and farms. The waste materials from farms include fertilizers (nitrates), pesticides, and other agrochemicals. Pollution of seawater is normally caused by oil spills. The use of DDT for fishing also causes water pollution.

Water pollutants and their effects are:

- **Untreated Sewage**: This is likely to contain pathogens, which may contaminate drinking water, fish, or other animals used as food.
- **Industrial Waste Materials**: Industrial waste materials from factories are many and varied. Some are poisonous to aquatic animals and plants.

- **Agricultural Waste Material**: These include fertilizer, pesticides, and other agrochemicals that are used in large amounts; the excess sometimes drains into nearby freshwater and kills animals livings there.
- **Oil spillage**: Oil spillage causes the death of sea birds both by poisoning them and sticking their feathers together so they can no longer fly.

Control of Water Pollution

- Industrial waste material should be recycled, or if that is not possible, treated and released in controlled amounts.
- Sewage should be treated before being discharged into freshwater or
- Farmers should avoid using anxcessive amount of insecticides, pesticides, and fertilizers. The loading and off-loading of oil tankers should be strictly supervised.
- Farmers should be encouraged to use organic manure instead of chemical fertilizers.

Land pollution

Generally, indiscriminate disposal of waste causes land pollution. The causes of land pollution are as follows: traditional gold mining locally called 'galamsay' through sophisticated mining techniques, has exploited the land resources and the natural beautiful scenes, and replaced them with a heap of debris and waste. Stone quarries are increasing in number and growing into large commercial ventures, increasing the disfiguring of the land. Land may also be polluted by discarded objects like old cars and lorries, plastics, tin cans, and bottles, and by industrial wastes.

Land degradation

Land degradation is the gradual deterioration of the land leading to its inability to support plant and animal life. The causes of land degradation include unsustainable agricultural practices; overgrazing by livestock; deforestation; soil erosion etc. Land degradation can be prevented by:

- **Practicing sustainable agriculture**. E.g. crop diversification, the introduction of high-yielding and drought-resistant crop varieties, adoption of mixed cropping systems, crop rotation, etc.
- **Pasture management**. E.g. reducing livestock stocking densities, regulating grazing by livestock, rotational grazing, etc.
- **Forest and woodland management**. E.g. establishment of forest or tree crop farms, minimizing agricultural expansion, especially shifting cultivation, the institution of policies to regulate illegal commercial logging, and practicing afforestation.
- **Prevention of erosion** by mulching, terracing, growing cover crops, contour ploughing, etc.

Control of Land Pollution

- People in communities should be educated on how to maintain healthy surroundings.
- Waste products like metals and plastics should be recycled.
- Plastics can be burnt under controlled conditions to protect men from their poisonous fumes. Application of pesticides, fertilizers, and other agrochemicals in the correct manner and in their correct amounts.

- Also, there is the need for the government to enforce the Bylaws of 1975 which prohibit unauthorized structures.

Air pollution

It refers to the presence of harmful substances in the air. This is mainly caused by gases and smokes from factories and exhaust pipes of motor vehicles. Air pollution can also be caused by dust particles from quarries and construction sites. Gases such as chlorofluorocarbons (CFC's), sulphur dioxide (SO_2), carbon monoxide (CO), Hydrogen sulphide (H_2S) get into the air as a result of the activities of factories, domestic fires, and burning of fuel.

Effects of Air Pollutants

The pollutants of air have the following effects:

- **Dust and smoke**: This is usually a suspension of carbon particles in the air. This may irritate the respiratory system and lead to respiratory diseases like asthma.
- **Sulphur dioxide (SO_2):** This is an irritating choking gas that is poisonous to plants and reduces crop yields. It also makes lung conditions worse.
- **Oxides of nitrogen**: Oxides of nitrogen in certain conditions form compounds which are poisonous to plants and possibly to animals. They sometimes cause eye irritation in men.
- **Lead compounds**: These are poisonous to plants and sometimes to animals. They build up to poisonous concentrations in the bodies of people who are exposed to high concentrations of petrol fumes for a long time.
- **Carbon monoxide (CO)**: This gas is poisonous to man because it combines with haemoglobin. In this condition, haemoglobin is unable to combine with oxygen to form oxyhaemoglobin, so cannot function as an oxygen carrier. This can easily lead to death. Carbon monoxide, even at low concentration, can cause series of headaches and stomach cramps
- **Carbon dioxide (CO_2)**: This gas is produced by fuels eg, coal, oil and ordinary firewood, palm nut shells, etc. The concentration of carbon dioxide in the air is kept constant by the absorption of increasing concentration levels by the atmosphere. This can cause what is termed the 'greenhouse effect, that is, some heat normally radiated from the earth into space is trapped by carbon dioxide. This warms the atmosphere.

Control of Air Pollution

- The effects of air pollution may be prevented or reduced by the following methods: Passing the waste gases from factories through filters and absorbers which remove the pollutants before discharge.
- Setting factories of generation stations away from residential areas.
- Building tall factory chimneys, so that waste gases discharge high up the air
- Using lead-free petrol in cars.
- Using smokeless fuels such as LPG in houses and factories
- People should be advised to stop destroying our forestland through bush burning.

Noise pollution

Have you heard of the adage, 'Even the elephant has got a limit to the weight it must carry'?. The same is with the ears of living things. There is a certain amount of sound that becomes harmful to us. Noise pollution, also known as sound pollution or environmental noise is the creation of all forms of sound in the environment which is harmful to the living organisms in the environment. It is created by machines from industries, cars and motors, corn mills and sound systems from shops. Can you name a few more? Sometimes it is strange to enter shops and feel the deafening sound when the people there appear used to it. Sound level is measured with a Sound Level Meter (SLM). It is also known as Noise Level Meter (NLM) and measured in decibels. According to the World Health Organization (WHO), noise above 65 decibels (Db) constitutes noise pollution.

How to control sound pollution

Noise levels can be controlled through public education on its health effects.

There is also a need for municipal authorities to educate people on the effect of noise pollution on other people in their neighbourhood as well as the legal implications. There are international and national laws regarding noise levels. Municipal authorities must also enforce laws regarding noise in the society.

Key Ideas

- Pollution is the release of harmful substances to the environment
- These harmful substances are called pollutants.
- Pollution occurs in several forms: air, water, land, noise, etc.
- Pollution is dangerous to human beings and other living organisms.
- We have contributions to make in reducing pollution in the environment.

Reflection

Dear Student, this session helped you to understand what environmental pollution is. The session also described the common types of pollution in the environment, namely, water, land, and air pollution. The effects and prevention of all these types of environmental pollution were also discussed.

What can you do in your own way to reduce the effect of these pollutants on your environment? How can you influence your students to do the same thing?

Discussion

- What is Pollution?
- State any three types of environmental pollution studied in this session.
- Explain any one of the types of pollutions and give three (3) effects of it.
- What is a pollutant as studied in the session?

SESSION 4: SANITATION: CLEANING AND TIDYING

Sustainable Development Goal target 6.2 calls for adequate and equitable sanitation for all. The target is tracked with the indicator of "safely managed sanitation services" – use of an improved type of sanitation facility that is not shared with other households and from which the excreta produced are either safely treated in situ or transported and treated off-site. In this session, we shall look at what sanitation is, the effects of poor sanitation and why is it important to practice cleaning and tidying around the environment.

Learning outcomes

By the end of this session students will be able to;

- describe what sanitation is;
- discuss four effects of poor sanitation;
- explain why it is important to practice cleaning and tidying around the environment.

Sanitation and Health

Some 827 000 people in low and middle-income countries die as a result of inadequate water, sanitation, and hygiene each year, representing 60% of total diarrhoeal deaths. Poor sanitation is believed to be the main cause of 432 000 of these deaths. Sanitation refers to public health conditions related to clean drinking water and adequate treatment as well as disposal of human excreta and sewage. Sanitation is the process of keeping places clean and healthy, especially by providing a sewage system and a clean water supply. Preventing human contact with faeces is part of sanitation, as is handwashing with soap. Sanitation systems aim to protect human health by providing a clean environment that will stop the transmission of disease, especially through the faecal-oral route. Many diseases are easily transmitted in communities that have low levels of sanitation. They include ascariasis (a type of intestinal worm infection or helminthiasis), cholera, hepatitis, polio, schistosomiasis, and trachoma, to name just a few. Sanitation is one of the most important aspects of community well-being because it protects human health, extends life spans, and is documented to provide benefits to the economy. Sanitation (e.g. toilets, latrines, mechanized wastewater treatment) is currently deployed as a way to contain and treat human excreta to protect human health and the environment. "Improved" access to sanitation is defined by the Joint Monitoring Programme (JMP) as one that separates "human excreta from human contact" in a hygienic manner (e.g. flush toilet, ventilated improved pit latrine (VIP), piped sewer systems, composting toilets, and septic systems) (WHO/UNICEF JMP, 2017). Examples of unimproved sanitation are pit latrines without a slab and bucket or hanging latrines.

Benefits of Improving Sanitation

Benefits of improved sanitation extend well beyond reducing the risk of diarrhoea. These include:

- reducing the spread of intestinal worms, schistosomiasis and trachoma, which are neglected tropical diseases that cause suffering for millions;
- reducing the severity and impact of malnutrition;
- promoting dignity and boosting safety, particularly among women and girls;
- promoting school attendance: girls' school attendance is particularly boosted by the provision of separate sanitary facilities; and

- potential recovery of water, renewable energy and nutrients from faecal waste. A WHO study in 2012 calculated that for every US$ 1.00 invested in sanitation, there was a return of US$ 5.50 in lower health costs, more productivity, and fewer premature deaths.

Cleaning and Tidying the environment

Your environment, both at home and at work, plays a critically fundamental role in your physical and mental health, as well as your overall well-being, much more than you might have ever given it credit for. A dirty or uninviting environment doesn't just cause infections or repulsion, it also pulls apart your emotional control and mental stability. On the other hand, a clean environment facilitates sound healthy and helps build robust well-being. There are two major sides to having a clean environment. One involves removing dirt and filth while the other has to do with tidiness: having every single item in its rightful and appropriate places at all times. Many studies have connected clean environments to a healthy and happy life. So, despite the increasingly degenerating environmental hazards, for whoever knows the benefits of a clean environment, creating one becomes a must. A task that must be accomplished at all costs. The following are the benefits of keeping a clean environment.

- **Infections-free life:** Unarguably, germs and other harmful microorganisms thrive in filth. And infections go hand in hand with germs and their kinfolks. But once your environment is clean: washed, disinfected, and sanitized, you're sure of an infection-free living.

- **Increased self-confidence:** Satisfaction with your environment automatically boosts your self-confidence. The truth is it's not likely you readily know the source of this extraordinary self-assurance except you take time to reflect. But you'll certainly feel it in you. You're sure you've got it. You know you're super confident. This can be brought about by being in a room with bright light, both natural and artificial. Besides, this kind of environment can help improve depression and anxiety. This means you'll always be in the right frame of mind; no depression, no anxiety.

- **Higher productivity:** When your environment is clean, neat, and nice, it turns you into a perpetually happy person. All negative emotions are banished and your creativity kind of gets a rebirth. This translates into solid well-being and invariably tells on your productivity. Happy people are super productive people.

- **Sense of propriety:** A clean environment makes it difficult for people to just leave things lying about or drop litter. This is not about you alone. It is rather positively contagious. Everyone around you is influenced. In other words, a clean environment positively impacts your behavior and gives you reasons and impetus to act on keeping it always clean. And you end up managing your space better than you can imagine. You must have noticed too that people are reluctant to litter or clutter a place that is clean and neat, whereas they eagerly help a dirty environment degenerate.

Key Ideas

- Sanitation refers to public health conditions related to clean drinking water and adequate treatment as well as disposal of human excreta and sewage.
- Poor sanitation can lead to high rates of disease transmission in communities
- Good sanitary conditions reduce the effect of malnutrition
- Keeping good environmental conditions is necessary to keep infection-free lives among people, increase self-confidence and productivity and inspire others to keep doing the right thing

Reflection

This session helped you to understand what sanitation is. It further explained that sanitation is the most important aspect of community well-being because it protects human health and extends life spans. At the end of the discussion, the session elaborates more about why there is a need for cleaning and tidying around your environment to promote good hygiene. Finally, your well-being is a delicate flower of many colours; it deserves your attention. Keep your environment always clean and tidy, and enjoy life to the fullest

UNIT 2: WATER AND OTHER LIQUIDS

Hello! Dear students, you are welcome to unit two of our module. In the previous unit, we discussed some basic natural occurrences in the environment as well as our response to the environment. In that study, we also considered the dangerous effect of pollution, including that of water. We ended the unit with the need to take good care of our sanitation. This included a good treatment of our water. Our discussion in this unit will lead us to learn the differences in liquids such as water, cooking oil, and honey. We shall also explore the physical properties of water, its sources, importance, and uses.

Learning outcomes

By the time you finish reading through all the sessions of unit two, you should be able to:

- Identify the differences in liquids (water, cooking oil, honey) using simple science activities
- Describe some physical properties of water
- Discuss the various sources of water in our communities
- Use activities to investigate the importance and uses of water

SESSION 1: IDENTIFYING DIFFERENCES IN LIQUIDS (WATER, COOKING OIL AND HONEY)

Dear Students, you are welcome to the first session of unit two. As you notice from the overview, the first topic for our discussion is identifying differences in liquids. In this session, we shall explore the differences in three liquids I believe students regularly interact with in their day-to-day lives in their environment. They are water, cooking oil and honey. We shall identify and discuss the qualities or characteristics that distinguish these liquids from each other; and how we can introduce these ideas to our learners.

Learning outcomes

By the time you thoroughly complete this session, you will be able to clearly:

a. Describe an experiment each to show how water, cooking oil and honey are different from one another.
b. Identify the differences in the way the different liquids react with paper.

Come with me …

Differentiating water and cooking oil is quite easy. The difference between both substances can be investigated by comparing their physical and chemical properties, as well as their uses. Water is made of two hydrogen atoms and one Oxygen atom, bonded altogether. It covers more than 70 per cent of the total surface of the planet. It undergoes a constant process of evaporation and precipitation, among others, as part of its unique cycle. Cooking oil includes the well-known palm oil, olive, sunflower, and canola oils and the not-so-well-known coconut and soy. It is used both as edible oil and as a lubricant for metal surfaces because of its high viscosity. Honey is one of the most widely sought products due to its unique properties, which are attributed to the influence of the different groups of substances it contains (Buba, Gidado & Shugaba, 2013). The bees collect the sweet juices from various honey plants, process them in their digestive systems, and then store them in wax honeycombs, which are collected by beekeepers. Honey is made up of less than 20% water and 70% sugar. Table 1 is an overview of the differences between water, cooking oil and honey.

Table 1: Summary of the differences between water, cooking oil and honey

Water	Cooking oil	Honey
• Water evaporates when it becomes hot and boils	• Cooking oil breaks up before it starts boiling, but there is no evaporation during the cooking process	• The water component of honey evaporates when heated leaving a concentrate of the other components
• Water is a bi-polar substance and non-viscous	• It is a non-polar substance that is highly viscous	• Honey is a polar substance and more viscous than water and cooking oil
• It evaporates as a vapour	• It burns and releases smoke	• The water component of honey evaporates when heated
• Water in its natural state does not hold any odour and taste	• Cooking oil possesses some form of odour and taste, which depends on the source of the oil.	• Honey is sweet and varies in colour
• Water is also a transparent medium	• Cooking oil (coconut oil and palm oil) are opaque or non-transparent substance	• Honey is a translucent substance
• It can be of three states, namely: Solid, liquid and gas	• It mainly exists as liquid and semi-solid	• It exists in liquid and crystallises when stored in a jar for a long period
• It is considered a universal solvent since it can dissolve many substances	• It dissolves some substances but not as much as water	• Honey behaves as a natural deep eutectic solvent used for the extraction of bioactive compounds of herbs
• Water is also the prime fighter against fires	• Cooking oil burns in fire	• Naturally, pure honey burns in the fire.
• It has a low boiling point as compared to cooking oil.	• Higher boiling point than water.	• The water component of honey boils at 100 degrees Celsius while other

		components boil at their respective temperatures.

Let us look at an experiment that can enable us to identify cooking oil and water. These are simple science activities that you can carry out with your learners.

Water and cooking oil experiment
Materials:
glass or bottle
water
vegetable oil or a similar cooking oil
dish washing liquid

Activities:

- Pour water into the glass.
- Add vegetable oil to the water in the glass.
- Shake the mixture and leave it to stand on the table for a few minutes

Observation

- Observe and guide your learners to describe what happens to the mixture in the glass.
- The vegetable oil and water separate into layers.
- Add dishwashing liquid and shake the mixture for about 30 seconds. Observe what happens.

We can explain that water and cooking oil are both made up of molecules that are strongly attracted to each other. Water molecules have a positive charge on one end and a negative charge on the other end. Since the opposite ends of the molecule have different charges, it is called a polar molecule. The molecules in the oil are more evenly spaced out, and therefore do not have charges on the opposite ends of the molecule. These are called non-polar molecules. Since the water and cooking oil molecules are different in their chemical compositions, they do not mix. The cooking oil suspends on the surface of the water. When the dishwashing liquid is added, it causes the bonds between the molecules to change and allows the liquids to mix.

Water and honey experiment (The Water Test)
Materials:
Glass or bottle, teaspoon, honey, and water.

Activities:

- Take a teaspoon of the honey and put it in a glass half full of water.
- Stir the mixture of honey and water and leave it for a few minutes

Observation

- Guide the learners to observe and describe how the mixture looks
- It will be observed that the honey dissolves in the water and maintains its color in the water.
- The same is the case with blotting paper or a white cloth. If you drop pure honey on the two, it will not get absorbed or leave stains, but remains white and stainless.

Key Ideas

- Chemically, water is made up of hydrogen and oxygen atoms.
- Honey is the most viscous among the three liquids selected above (water, cooking oil, and honey)
- Regarding light energy, water is transparent, honey is translucent and cooking oil is opaque

Reflection

In this session, you learned about the unique characteristics of water, honey, and cooking oil which distinguish them from each other. Furthermore, you have looked at activities that you can perform to explain how water reacts with honey and cooking oil.

Discussion

In what ways do you find water different from cooking oil and honey?

SESSION 2: DISCOVERING THE PHYSICAL PROPERTIES OF WATER

Dear Students, in session one, we identified a chemical property of water and compared water with two other common liquids in our environment. Do you remember them? We considered some activities that can be performed to explain the reaction of water with the other two liquids. In this session, we are set to focus on water and examine its physical properties. We shall also discuss various activities that we can undertake with our learners to explore some of these properties.

Learning outcomes

By the end of this session, you should be able to:

- Identify at least four physical properties of water
- Describe some simple experiments to explore some of the physical properties of water
- Discuss the implications of the properties of water for living organisms.

Are you ready?

Properties of water

The properties of water make it suitable for organisms to survive in it during differing weather conditions. At normal earth temperatures, water is the only compound that occurs in all three states of matter. In the solid state, we can consider ice block as an example. Ice is a typical example of water in a solid state. Ice melts into the liquid state of water when exposed to heat. When you further heat water, the molecules form vapour and begin to escape from its surface. This vapour represents the gaseous state of the water.

Water has other unique properties. It gains and loses heat energy slowly compared to other compounds. In addition, water in its solid state is less dense than in its liquid state. This is why we usually see ice floating on top of liquid water. Moreover, different substances dissolve in liquid water to form solutions than any other chemical.

Water's physical and chemical properties are due to the structure of its molecules. Look at Figure 2.1. Each water molecule has two hydrogen atoms and one oxygen atom.

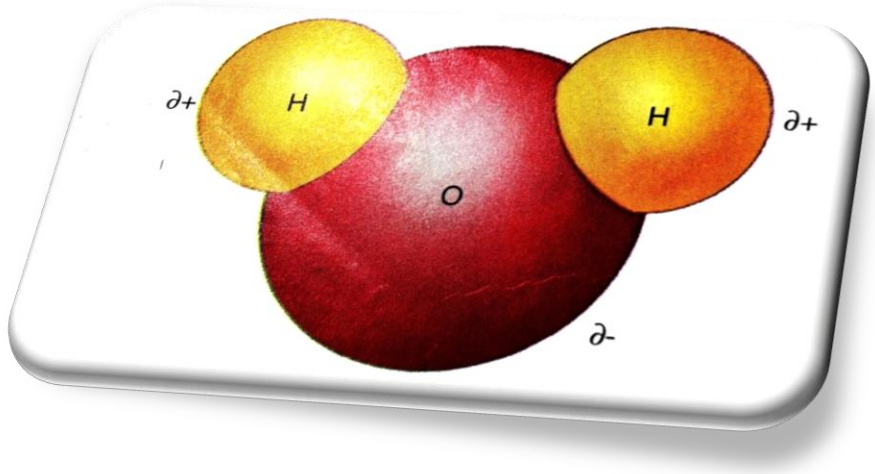

Figure 2.1: water molecule

A polar molecule has electric charges

Water is a polar molecule. The parts of a polar molecule have slight electric charges. A water molecule's hydrogen atoms have a slight positive charge. The oxygen atom has a slight negative charge. Recall that opposite charges attract and like charges repel. In liquid water and ice, water molecules align so those opposite charges are next to each other. This attraction makes water molecules tend to "stick" together.

Physical properties of water

The physical properties of a substance are characteristics that can be observed without changing the identity of the substance. It is essential to monitor the physical aspects of water quality to determine if the water is polluted or not. Physical characteristics can be determined by:

- Colour – pure water is colourless; coloured water can indicate pollution. Colour can also show organic substances. The maximum acceptable level for the colour of drinking water is 15 TCU (True colour unit).
- Turbidity – pure water is clear and does not absorb light. If turbidity appears in the water, it may indicate water pollution.
- Taste and odour – pure water is always tasteless and odourless. If any type of taste or smell is present, it may indicate water pollution.
- Temperature – the temperature is not directly used to evaluate whether water is drinkable or not. However, in natural water systems like lakes and rivers, the temperature is a significant physical factor that determines water quality.

- Solids – If water is filtered to remove suspended solids, the remaining solid in the water indicates the total dissolved solids. If the dissolved solids in the water exceed 300 mg/l, it adversely affects living organisms as well as industrial products (Element, 2021).

Let us now discuss the following selected examples of the physical properties of water. You will also observe that some activities have been suggested for you to carry out with your learners. Please perform them with your young learners to investigate some properties of water. Through questioning and answers, guide your learners to identify some real-life applications of each of the activities you perform.

Water gains heat energy

When you heat a pan of water on a stove, which heats faster, water gains heat energy slowly. Remember that heat is the energy of moving molecules. It takes a large amount of heat energy to separate polar water molecules and to get them moving. Water also retains heat.
When water looses heat energy, it expands.

Activity to demonstrate that water expands on cooling

Things needed: a plastic bottle, water

- Pour water into the plastic bottle to the brim
- Observe the shape and volume of the bottle
- Cork it and put it in the deep freezer
- Leave it until the next day
- Observe the shape and the volume of the water in the container

Observation: the shape of the container enlarged.

Conclusion: water expands on freezing

Surface Tension

Water also forms a skin-like layer on its surface due to surface tension. Surface tension gives water droplets a round shape. Surface tension occurs because water molecules attract each other. The attraction between water molecules also makes them act like beads on a string. When a force pulls one molecule, others follow. Follow through with the activities below:

Materials: Cup, water, and grounded charcoal or chalk.
Activities:

- Half fill a cup with water.
- Sprinkle a thin layer of grounded charcoal on the water.
- Use a clean toothpick and touch the surface of the water.
- Observe what happens. You will notice that the particles of the grounded charcoal will still spread across the surface of the water.
- Dip the toothpick in a container of soapy water and then touch the water again.

Observations:

- The particles of the grounded charcoal/chalk will float on the water because the surface tension of water holds it up.
- Observe that the grounded charcoal/chalk instantly spreads to the edges of the dish because the surface tension property of the water was broken by the soapy water which dropped into it.

Give your learners the chance to perform the experiment and discuss their observations.

Ice floats in water

Ice is less dense than liquid water. Water is densest at 4^{o}C. Usually, the molecules in a solid are closer together than those in a liquid. But, like charges repel, so polar water molecules can't get very close together. In ice, water molecules form large, open structures called crystals. The open structures of ice that allow for maximum hydrogen bonding explain why ice is less dense than water.

Water isn't easily compressed.

If you try to push an object down into it, the water pushes back. The upward pressure on the object can cause it to float.

Capillary action of water

Plants could not grow well without capillary action. By capillary action, water rises up from the bedrock so that it will be available for plants to absorb.

Experiment to demonstrate the capillarity of water

You will need the following materials: a small bowl/ beaker/ cup, water, food colour or ink and white paper towel or thread.

Activities:

- Fetch water into a bowl of a reasonable size.
- Add a drop of ink or a pinch of food colour to the water and let it dissolve. Why was this necessary? Do you remember I mentioned that water is transparent?
- Dip a white paper towel/thread into the small bowl of coloured water and observe.

Observations:

- You and your learners will observe that the coloured water climbs up the white towel/thread against gravity. Once again, the water molecules are drawn to other molecules and overcome the force of gravity hence the action of capillarity. One of the reason for colouring the water was to make its rise easily visible

Figure 2.2 Capillarity in water

Water as a universal solvent

Water is called the universal solvent because more substances dissolve in water than any other chemical. However, water does not dissolve everything in nature. water can dissolve more substances as a result of its polarity. As mentioned earlier, the hydrogen molecules carry a slight positive charge, whiles the oxygen carries a slight negative charge. This electric feature assists water to separate ionic compounds (substances) into its positive and negative ions and attracted to the unlike poles of water molecules.

Some substances dissolve in water

You will need the following materials for the experiment:

- Transparent containers e.g. beakers, cups.
- Water (warm and cold)
- Substances to dissolve e.g. sugar, coffee, grounded chalk, sand, flour, salt.

Figure 2.3 Items needed for the water dishwater-dissolvinges experiment.

Activities:

- Add a teaspoon of whichever solid (e.g. salt, sugar, chalk powder) you are testing to a glass of cold water and a glass of warm water.
- Stir both mixtures thoroughly and observe the difference.
- Watch to see if the solid dissolves in warm water and cold water and if one is better than the other.

Observation and conclusion:

- It will be observed that the mixtures of sugar and salt dissolved in both the cold water and warm water.
- It was also observed that the chalk powder did not dissolve in either cold water or warm water.
- The particles of the chalk powder are only suspended on the surface of both the cold water and warm water.
- Can you design a chart to record your observations for dissolving in warm water and cold water?

From the observations, it can be concluded that some substances can dissolve in water but not all substances are dissolved by water. Moreover, water dissolves more substances than all other liquids or solvents. Again, water dissolves substances faster when warm than cold.

Key Ideas

- Water has many unique properties, many of which are based on its molecules' ability to form hydrogen bonds.
- Water is found at earth's temperatures as a solid, liquid, and gas.
- It has a high specific heat capacity and boiling point.
- Water can rise in narrow tubes by a process called capillarity
- Water experiences surface tension

Reflection

The discussion in this session equipped you with knowledge about the physical properties of water. You have good information to share with your students to help them decide what to drink or not. Through this approach, you can prevent many water-borne diseases (which we hinted in previous sessions in this module). The session also discussed various activities that we can undertake with our learners to discover some of these properties.

Discussion

- What properties of water will you look out for before using it in the kitchen?
- When one end of a towel is soaked in water, how does it get to the other end?
- Describe an activity to demonstrate the capillarity of water.
- Explain how relevant the surface tension property is important to insects.

SESSION 3: SOURCES OF WATER

Hello! Students, welcome to session three of unit two. In session two, we learned about several physical properties of water. Some of these physical properties are linked to the sources from which it is obtained. In this session, we are going to learn about the various sources of water in our communities. There are numerous sources of water ranging from underground sources to surface sources. Oceans, ponds, lakes, rivers, springs, aquifers, and streams are some of the main water sources in the world. Water is one of the most important commodities on earth and it is essential to human life. This session prepares the stage for our in-depth study of the uses of water and other liquids in our next session.

Learning outcomes

The following objectives will guide our discussions in this lesson. By the end of this session, you should be able to:

- List and describe five sources of water
- Mention at least four rivers in Ghana and where they can be located.

Come with me…

Oceans

Oceans are the largest sources of water on the planet. There are five oceans in the entire world. They contain approximately 97% of all the earth's water. Despite the massive quantities of this essential commodity, ocean water is not suitable for human consumption in its raw form. It contains high salt levels and other impurities that make it unsuitable for household use. However, countries situated in dry regions such as Saudi Arabia, the United Arab Emirates, China, Oman, and Australia use a technique known as desalination to purify ocean water. Desalination involves the striping of salts and other components found in ocean water. The process is not widely used due to the huge costs and high energy levels involved. A popular mode of purifying saltwater from the ocean is reverse osmosis where water passes through microscopic pores and salts among other impurities are filtered.

Lakes

Lakes are an important source of livelihood for many people around the world. Scientists estimate that there are 117 million lakes throughout the world. Lakes are classified into two categories: saltwater lakes and freshwater lakes. Water found in lakes is put to different uses by the communities that live around the natural resource. The main use of lake water is in the fishing industry. Most people who live near lakes practice fishing. Farming communities also use lake water to irrigate their farms and boost their agricultural output. Additionally, water in lakes is used as a mode of transport from one point to another by the use boats or advanced equipment to travel across the water body. There are few lakes in Ghana, Lake Volta, the largest artificial reservoir in the world based on surface area, is contained behind the Akosombo Dam which generates a substantial amount of Ghana's electricity. Lake Bosomtwe is the only natural lake in Ghana.

Rivers

Rivers are natural paths through which water flows toward another river or a larger water body. Countless rivers are flowing in different directions throughout the world. Rivers are important sources of food, mode of travel, hydro-power sources, and popular tourist attractions. The world's most

prominent river, the Amazon River flows through Peru, Columbia, and Brazil and provides water for farming, hydro-power generation, marine life industry, and transportation. It also serves as a tourist site. There are many rivers in Ghana. Some of them are Pra, Densu, Birim Oti, Ankobra. Can you name more?

Streams

A stream is a body of water with surface water flowing within the beds and banks of a channel. The flow of a stream is controlled by three inputs – surface water, subsurface water, and groundwater. The surface and subsurface water are highly variable between periods of rainfall. Groundwater, on the other hand, has a relatively constant input and is controlled more by long-term patterns of precipitation (Alexander et al., 2015). Depending on its location or certain characteristics, a stream may be referred to by a variety of local or regional names. Long large streams are usually called rivers.

Figure 3: A Stream at Amedzofe

Glaciers and Icecaps

Glaciers and ice caps are natural sources of fresh water. Glaciers are formed when large pieces of ice accumulate over several years. Most glaciers and ice caps are found in extremely elevated regions and areas close to the North and South Poles. They are critical naturally occurring resources that help regulate the earth's temperatures and climatic conditions. Glaciers are the largest sources of fresh water, and they store an estimated 75% of the earth's fresh water. Even with the large quantities of useful fresh water contained in glaciers and ice caps, they are rarely used as water sources due to the high amount of funds needed to melt the thick ice and transport the water to residential areas. The enormous natural bodies melt slowly and flow into nearby rivers where people use the water. Glaciers and icecaps are rare in Ghana due to our hot temperatures.

Aquifers

Aquifers are water sources found below the surface of the earth. They are underground rock formations that contain water. An estimated 30% of the world's liquid water is found below ground. Water in underground aquifers may come to the surface through natural springs. In some cases, the water is pumped to the surface through specialized equipment. Aquifers are important water sources, especially in arid areas. The cost of extracting the water from aquifers is often within reach. The natural resources provide water for irrigation, industrial use, and household needs. Some aquifers have highly saline water that needs to be desalinated before being put into use.

Ponds

Ponds are shallow water sources usually smaller than a lake. Ponds are part of the many surface water sources. Some ponds occur naturally while others are human-made. Ponds may contain aquatic plants and animals. Water found in ponds is often used to support agriculture, the fishing industry, landscaping ventures, and the rehabilitation of damaged land. Some ponds are used as habitats for rare and endangered species. As a result, they improve the biodiversity in areas where they are found.

Springs

Springs are natural freshwater sources found on the earth's surface. They get their water from underground streams or aquifers. Some springs may produce hot water, like the breathtaking geysers, while others produce cold water. Spring water is often used in the commercial production of drinking water. Additionally, hot springs are popular tourist attractions, religious sites, and recreational centres.

Rainwater

Rainwater is the cheapest naturally occurring water source. It is a seasonal source of water. The rainwater is collected in water tanks and dams in the rainy season for use in the dry season. Most people in the developing world rely on rainwater as their only source of water. Rainwater is used for household needs, farming, replenishing ponds, and hydro-power generation (Sawa, 2019).

Key Ideas

- The sources of water include oceans, lakes, rivers and streams
- Oceans contain approximately 97% of all the earth's water
- Not all sources of water are appropriate for use until treated
- Some sources of water are not common in Ghana because of the high temperatures we experience
- Desalination is the process of removing the saltiness of water

Reflection

During this session, we discussed the various sources of water for living organisms. In our discussion, you learned about the nature of the sources of water and the kind of water that comes from these sources. Moreover, you also acquire knowledge about the different kinds of rivers and lakes that can be found in Ghana.

Can you think of organizing a field trip for your pupils to places of interest, regarding water sources? There, they can have the practical experience of this session. What a lovely lifetime experience it will be!

Discussion

- Can you identify some rivers that are within your region in Ghana?
- Why do you consider rivers relevant to humans and animals?

SESSION 4: INVESTIGATING THE USES OF WATER AND OTHER LIQUIDS.

Hello! Dear Students, I hope you are gaining some insights into the various sources of water. Based on our discussion of the previous session, we hope you can identify and describe some sources of water and their uses in our communities. In this session, we will discuss the various uses of water in terms of its industrial, domestic, agricultural, sports, and ecstatic purposes. Moreover, we will also discuss the uses of other liquids such as alcohol. Finally, we are going to be learning about some interesting activities that we can do with our learners to investigate the uses of water and other liquids.

Learning outcomes

The following expected learning outcomes will guide our discussions in this session. By the end of this session, you should be able to:

- State seven major uses of water
- Identify examples of specific uses of water in these major groups.
- Identify some common liquids in your environment and identify their uses

Come with me…

Uses of water

Water is stored in various parts of the world but not evenly distributed all over the earth. We have identified various sources of water such as; sea, lake, rain, well, stream, borehole, and pond. It is used for washing, drinking, generating electricity, etc. Below are the different uses of water in various fields which are summarized into seven categories in table 4.1 (Water Encyclopaedia, 2021).

Table 4.1: Categories of water use and examples

Category of water use	**Examples of water use**
Commercial	Fresh water for hotels, guest houses, restaurants, office buildings
Domestic	Water is used for drinking, cooking, bathing, washing clothes and dishes, flushing toilets, watering lawns and gardens
Agriculture	**Crops**: Water is supplied to crops on the field, pasture, and horticultural crops, nurseries, and gardens. It is also used to irrigate pastures. It is also mixed with chemical fertilizers and sprayed for plant use. Water is a coolant for plants too. Water in the soil contributes to the leaching of salts from the crop root zone. **Animals:** Water for livestock animals, feed lots, dairies, fish farms, production of red meat, poultry, eggs, milk, and wool, and for horses, rabbits, and pets.
Sports	Water is used to irrigate public and private golf courses, parks, turfs, and other sports-related landscapes
Industrial	Industries such as steel, chemical, paper, and petroleum use water for processing, cleaning, transportation, dilution, and cooling of manufacturing facilities. Water is a coolant for car engines.

Mining	Water is used for the extraction of naturally occurring minerals; solids, such as coal and ores; liquids, such as crude petroleum; and gases, such as natural gas; for quarrying, milling (such as crushing, screening, washing, and flotation)
Hydroelectric power generation	The Akosombo dam provides water for hydroelectric power generation in Ghana

Uses of other liquids.

A liquid is a fluid made up of molecules which has greater freedom to move, though are held by forces. A liquid can flow, and assume the shape of its container. For this session, let us consider some other liquids and their uses. Table 4.2 summarizes some selected liquids and their uses.

Table 4.2 Some selected liquids and their uses

Liquids	**Examples of their uses**
Alcohol	It is used in manufacturing medicines and cleaning detergent Alcohol is used in the hospital for sterilization. It can be used for the extraction of nutrients from plants.
Milk	Used as food for infants and adults. It can be used as a diuretic substance (induce urine formation). Milk acts as a natural skin softener. Remove ink stains from clothes.
Kerosene	Used as lamps and Lighting Fuel. Heating oil in kerosene heaters. It is used as fuel in jet engines. Kerosene is used as a solvent for greases and insecticides.
Cooking oil	It is used in frying, baking, and other types of cooking. Removing paint from your hands. Soap making. Key lock lubricant.
Honey	It is used as natural cough syrup. Honey can be used as a wound cleaner and for the treatment of burns. It is used in manufacturing baby diaper rash cream.

Key Ideas

- Water can be used broadly for domestic, agricultural, industrial, and sports.
- Other areas in which water is used include mining and hydroelectric power generation.
- Alcohol, another liquid, is used by experts to manufacture medicines

Reflection: In this session, you learned about the uses of water. We further studied how water is used in homes, agriculture and in industry. During the session, we also learned about the uses of other liquids. We gained insights into the equally important roles these other liquids play in the ecosystem.

Discussion

Guide your students to be able to identify liquids that are common in their homes and associate them with their uses.

In your classroom, pair your pupils and ask them to share their thoughts on five major uses of water.

UNIT 3: ANIMALS, PLANTS AND SOIL

Dear students, you are warmly welcomed to the third unit of this course. I am sure you have had some thrilling encounters as we started with the science around us. It was interesting for me sharing some thoughts about everyday science around us, which we sometimes don't take notice of. Your relatives who live in other parts of the world complain of extreme cold at a time you experience extreme warmth! I hope you remember they are due to seasonal changes? In unit one, we still mentioned humankind's unfortunate response to nature in the form of pollution but also mentioned how we can improve our sanitation to reduce the effect of pollution in the environment. In our journey in this course, we studied about water and other liquids and the way humankind uses them to our advantage.

In this unit, we turn the light on other living things: plants and animals as well as the soil on which the plants grow. We live in a system. Plants grow on the soil, animals feed on the plants, plants and animals improve soil quality and so on. We will focus on the different types of insects, their habitats and how useful they are to plants and animals in the ecosystem. In addition, we will learn about pests and domestic animals and how pests are a threat to the growth and development of plants and animals. Moreover, we will learn about the soil, food crops, and the health benefits that we derive from the crops when we consume them. Remember, 'An apple a day, keeps the doctor away' Finally, we shall look at activities that we can perform to identify various types of soils and their uses.

Learning outcomes

After going through this unit, you should be able to:

1. Define plants and discuss their classification
2. Identify and explain at least five uses of plants
3. Explain the meaning, benefits, and effects of insect pests on food crops
4. Discuss ways of caring for plants

SESSION 1: INSECTS: VARIETY, HABITAT, AND USES

Dear students, you are welcome to the first of four sessions of unit four. In this session, we will learn about insects and the different types of insects. In addition, we will look at the habitats and their uses or benefits to humans. When you hear the term 'economic importance of insects', don't be confused at all. Of course, some of them, like mosquitoes, are vectors of diseases. Yet we have a lot of benefits from their activities

Learning outcomes

By the end of our discussion on this session, you should be able to:

a. Explain the term insects
b. Identify some types of insects
c. Explain the economic benefits of insects

Come with me, please…

Meaning of Insects

Insects are invertebrate arthropods that have a chitinous exoskeleton, and a body segmented into the head, thorax, and abdomen. This means that the external skeleton that protects the body is made of protein molecules called Chitin. Other important features of their body are the presence of one or two antennae, compound eyes, three pairs of legs, and usually one pair of wings (Resh & Cardé, 2009). Insects are important as they assist with many essential processes within an ecosystem, such as; pollination, decomposition, and acting as a food source. However, some insects are pests since they cause harm or nuisance to other living organisms. The total number of insect species documented is more than 1 million (Gullan & Cranston, 2014; Resh & Cardé, 2009).

Habitats of Insects

A habitat is the type of environment where an animal (including insects) or plant lives like a home, such as tropical rainforests, grasslands, or freshwater ponds (Fahrig, 2003). Animals are adapted to live in a particular kind of habitat where their needs are met. For example, a honeybee lives in a habitat where it can easily find its preferred food of flowers. Insects live in just about every habitat on earth, from the sands of hot deserts to cold snowy mountain streams. Most insects live on land, in fact, about 97% do (Museums Victoria, 2021). Many insects such as bees and caterpillars spend all of their lives on land. However, some insects live in freshwater. Dragonflies begin life in water such as rivers, lakes, and ponds, but then take to the air as adults. In addition, other insects, such as the diving beetle, spend most of their time in the water, but they must return repeatedly to the surface of the water to breathe air (Museums Victoria, 2021).

Owing to the great variety of insects and the sheer impossible number of different species, we have listed only a few in this module. Therefore, we will consider the main insect orders to discuss the varieties of insects. Table 3.1 summarizes the varieties of insects and their habitats.

Table 3.1: Overview of varieties of insects and their habitats

Variety	**Typical examples of insect**	**Habitat**
Lepidoptera	Butterflies and moths	Fields (e.g. parks, forest)
Coleoptera	beetles and weevils (ladybirds and fireflies)	Fields (e.g. forest), water
Hemiptera	The true bugs (aphids and cicadas)	Homes (place of humans dwellings)
Diptera	Mosquitoes and gnats (fruit flies)	Homes, water and fruits
Hymenoptera	Ants, bees and wasps,	Forest
Orthoptera	Locusts grasshoppers and crickets	Fields (e.g. forest, farms)
Blattaria	Cockroaches	Homes
Mantoea	Praying mantis	Fields (e.g. forest)

Economic Importance or uses of Insect

Economically, humans derive numerous benefits from insects. For this session, let us look at a few benefits, uses, or importance of insects in an ecosystem.

- Insects help in the process of pollination of flowering plants that leads to fruits production. The valuable role that insects play in the pollination of plants cannot be overestimated.
- They serve as a source of food in some homes. Honey is certainly high on the list of products made by insects that humans consumed. Some insects are eaten commonly as food. Example Mopane worms in Southern Africa.
- Silkworms are a source of silk, which is used in producing some clothes. Most silk is produced from the cocoons of the silkworm.
- Insects serve as agents in natural and biological control**.** The balance of nature depends on the activities of parasites and predators, the majority of which are species of insects.
- They also serve aesthetic purposes for humans**.** Insects are well known in various areas of arts and as pleasant to the senses. For example, butterflies are certainly one of the most appealing creatures in nature, with colours and patterns that are enjoyed by humans most of the year.
- Insects are a source of economic products such as beeswax and dye. These products rake in huge sums of money to economies (India, US, Britain, China) of nations, which harness these potentials in insects.
- Insects serve as dermestids for cleaning skeletons**.** Carpet beetles are small insects that will feed on almost anything organic, including cereals, carpets, and dried insects in collections. Museum technicians take advantage of this fact and utilize established colonies of dermestids to clean the skeletons of mammals (Eggleton, 2020).

Key Ideas

- Insects have three pairs of legs, a chitinous exoskeleton, and segmented bodies.
- There are several groups of insects based on certain peculiar characteristics
- Insects are important to plants and animals
- The activities of certain insects are also beneficial to man

Reflection

During our discussion on insects, we explained what insects are. We noted that insects usually have specialized features, which distinguish them from other living organisms. In addition, the session discussed the economic importance of insects in the ecosystem.

Discussion

Guide your pupils to identify some insects in your environment and describe their habitats
Discuss at least four economic importance of insects.

SESSION 2: PESTS, PETS, AND DOMESTIC ANIMALS

Dear students, Welcome to session two of unit three. The previous one was short but involving a lot of scientific terminologies. What were some of the terms that thrilled you, and what do those terms mean? You need to keep mentioning them so that you will be used to them. What about the economic importance you read about? Were you surprised in a way, seeing the benefits we get from such tiny animals? In this current session, we will discuss what pests are, and learn about different varieties, and the kinds of threats they pose to animals kept at home. This means we will start will identifying some of the animals that are kept at home as pets and their importance in society.

Learning outcomes

The following objective will guide our discussion in this session. By the end of this session, you should be able to:

- Explain the meaning of the term domestic animals
- Define the term pest and identify some types of pests
- Explain the effects of pests on domestic animals
- Explain the meaning of pets
- Differentiate between domestic animals and pets

Come with me…

Meaning of Domestic Animals

Domestic animals are animals that are captured and tamed to live with humans for economic purposes. They supply many products such as meat, dairy products, wool, and leather. Domestic can also be used for agricultural purposes such as ploughing the land for crop cultivation. Pets, on the other hand, are the animals solely kept for companionship in the household.

Domestic animals are once-wild animals that have been captured for many years and conditioned to adapt to different living conditions on the farm or in households. Mainly, they are captured for economic reasons. Having livestock today is considered a lucrative investment. Domesticated animals such as pigs, goats, sheep, chickens and cows provide meat and dairy products. Other products such as wool or merino wool are derived from sheep. Camels, donkeys, and horses are used for agricultural purposes to work the land, or for other transportation needs. Humans can tame domestic animals and even breed them to produce specific breeds with unique characteristics by modifying their genes.

Domestic animals are largely used for economic purposes with some also for recreational purposes. They predominantly rely on humans for their feeding requirements, although some can still go into the wild for grazing needs. Other domestic animals, especially mothers, can be dangerous to humans and can be life-threatening when protecting their babies. This happens if the relationship between humans and domestic animals is not well-established. Owners of domestic animals or caregivers seldom encounter such unfortunate situations where they are attacked by domesticated animals.

Pest in domestic animals

A pest is any living organism, whether animal, plant, or fungus, that humans consider troublesome to themselves, their possessions, or the environment. Pest as in domestic animals is any organism that disturbs the health and well-being of particular animals. It competes with the domestic animal for food, and water and makes the animal uncomfortable. In some cases, a pest causes infection in the animal or transmits disease from one animal to the other. Pests can be classified as a parasite, which lives on the body or inside the body of the animal and causes harm to it. Table 2.1 summarizes the types of pests (parasites) and examples of domesticated animals in which they can be found.

Table 2.1: Summary of types of pests (parasite) in domestic animals

Types of pest (parasites)	**Examples of domestic animals**	**Examples of the parasite (pest)**	**Harmful effect on the domestic animals**
Ectoparasites	Cattle, goats, horse, sheep and fowls	Ticks, lice, fleas-flies lice, mites, tsetsefly, mosquitoes, and flukes	These pests (parasites) live outside the body. In animals, they live on the skin and can cause itching and skin rashes. swollen lymph nodes, swollen joints leading to lameness,
Endoparasites	Cattle, goats, horses, sheep, pigs, etc.	Tapeworms, roundworms, hookworms, ascarids, whipworms, tapeworms, and Strongyloides	These parasites live inside the body. For instance, they may live in the blood system, muscles, liver, brain, or digestive systems of animals. They cause diarrhoea, loss of appetite and anaemia, etc.

Prevention and control of pest (parasites) in domestic animal

- Control of external and internal parasites usually revolves around the use of insecticides. The animals are drenched or sprayed using prescribed insecticides.
- Strategies or combinations of strategies for delivery include dust bags, back-rubbers (oilers), animal sprays, pour-ons, and insecticide-impregnated ear tags.
- The use of injectable products or pour-ons with systemic activity works well to control lice and mites.
- Larvicides can also be part of the control plan for certain types of flies as well as the use of predator wasps and environmental management.
- The place where the animals are kept, their water, feeds, and feeding trough should be kept clean always.
- Avoid overgrazing with the animals to prevent them from picking eggs and larvae of some parasites in the soil or at the root of some grasses.

Animal Pets

Popular pets in Ghana are dogs and cats. Generally, pets are animals that we keep mainly for companionship. They have an emotional attachment to the owners and other members of the household. Some pets like dogs have their ancestral origins in the wild, i.e. wolves. There is a wide variety of pets, which include rats, hamsters, snakes, lizards, fowl, avian pets, frogs, and many more. Pets are hardly linked to any economic benefits, but for companionship.

Humans have introduced breeding techniques, which produce different species of pets. There are many dog breeds such as pit bulls and German shepherds. These bred species can never survive in the wild with their counterparts because of their modified genes. As a result, they rely on humans for their feeding requirements.

Any wild animal that is obedient to humans can become a pet. However, most wild animals fear humans because they consider humans as dangerous predators. It is therefore difficult to establish any relationship with any animal. Dogs and cats are, however, popular household pets. They have a strong relationship with their owners. When they have health complications, they can be taken to veterinary facilities to be given care. It is because of the cosy and intimate relationship between pets and owners that owners are prepared to spend a lot for their health and nutritional needs.

Pets can be dangerous to strangers. They protect their owners and members of the household. Law enforcement officers use some pets to catch criminals. If pets get sick, they can potentially infect humans because of the contact. The differences between pets and domestic animals are summarized in Table 2.2.

Table 2.2: Differences between domestic animals and pets

Pets	**Domestic animals**
Pets are animals for companionship purposes	Domestic animals are kept for their economic benefits
Pets include cats, snakes, and dogs	Domestic animals include cows, donkeys, horses, chickens, sheep, and goats
Pets stay with humans in the household most of the time. They protect them from strangers	Domestic animals seldom stay in households. Only a selected number of domestic animals such as chickens stay in the household
Pets are often aggressive to strangers into the household	Domestic animals are rarely aggressive unless provoked. Particularly the mothers when protecting their babies can attack humans to death

Key Ideas

- Domestic animals are animals that are captured and tamed to live with humans for economic purposes.
- A pest is any living organism, whether animal, plant, or fungus, that humans consider troublesome to themselves, their possessions, or the environment.
- Pests are parasites
- Parasites can be ectoparasitic or endoparasitic, depending on where they live in relation to the organisms that suffer
- Some animals have been domesticated for varying purposes

Reflection

In this session, we talked about what domestic animals are. We also looked at the differences between a domestic animal and a pet. We further studied pests in terms of domestic animals and, classified pests according to where they can be located on the animals.

Discussion

How are pets different from domesticated animals?
Define a domestic animal in your own words.
Mention one similarity between pets and domestic animals.
What are pests?
Mention and discuss two main classes of pests.
Discuss three ways of preventing and controlling pests in domestic animals and pets.

SESSION 3: FOOD CROPS AND HEALTH BENEFITS

Dear Students, you are welcome to the third session of unit three. In our previous session, we looked at pests, pets, and domestic animals and tried to establish the link among them. We mentioned that the domestic animals depend to a large extent on their owners for food and other resources. In this session, look at food crops and the health benefits derived from them for human beings and animals.

Learning outcomes

By the end of studying this session, you should be able to:

- Explain the meaning of food crops
- Identify and state at least four types of food crops
- Mention at least six health benefits of a food crop to human beings

Come with me…

Meaning of food crops

The term "food crops" refers to the world's major food supply derived from plants; a crop assumes human intervention through agriculture. In the main, food crops consist of grains, legumes (including dried beans), seeds and nuts, vegetables, fruit, herbs and spices, beverage plants such as tea and coffee, and so forth.

A food crop can also be anything that is grown specifically for human consumption, either directly or as an ingredient in other foodstuffs (National Geographic, 2021). For example, corn is considered a food crop if it is to be eaten directly by people (corn on the cob), made into cooking oil or cornmeal or high fructose corn syrup, or used to feed animals that will later be consumed. Corn is not a food crop when it is grown to be converted into ethanol (alcohol).

Food crops form an essential part of the diet of humans, yet, during their production, harvesting, post-harvest handling, and storage they can be contaminated by microbial pathogens with the potential to cause foodborne illness. Consequently, strategies are needed, and technologies must be applied to ensure the safety of food crops destined for consumption either as minimally processed products, e.g. fresh produce, or for use as components in manufactured food products, e.g. cereals.

Types of Food Crops

There are several ways of grouping food crops. For instance, they can be grouped according to the number of months they take to mature for use. They can also be grouped according to the depth of their roots. In the table below, I have grouped them according to the crop 'families' they belong.

Table 3: food crops and their examples

Food crop	Specific example
reals	• Rice- O*ryzae sativa* • Wheat - T*riticum aesitivum* • Maize- Z*ea mays* • Barley- *Hordeum vulgare* • Sorghum- S*orghum bicolor*
Legumes	• Green peas • Soybeans • Lentils • Alfalfa
Vegetables	• Tomato - S*olanum esculentum* • Brinjal or egg plant - S*olanum melongena* • Chilly - *Capsicum annum* • Onion- A*llium cepa* • Leafy vegetables
Tubers	• Potato - S*olanum tuberosum* • Colacassia - C*olacasia esculenta* • Cassava –*Manihot esculenta* • White Yam-*Dioscorea alata* •
Fruits	• Mango - *Mangifera indica* • Apple - *Pyrus malus*

	• Guava - *Psidium gujava* • Banana - *Musa paradisiaca* • Papaya - *Carica papaya* • Pineapple - *Anonna squamosa* • Grape - V*itis sp.*

Benefits of food crops

Eating food crops give us a variety of nutrients from plant sources. These nutrients build body cells, give energy and repair worn-out body tissues. Some food crops improve our resistance to diseases. For more details, read on.

- Most vegetables are naturally low in fat and calories. None has cholesterol. (Sauces or seasonings may add fat, calories, and/or cholesterol.)
- Vegetables are important sources of many nutrients, including potassium, dietary fibre, folate (folic acid), vitamin A, and vitamin C.
- Diets rich in potassium may help to maintain healthy blood pressure. Vegetable sources of potassium include sweet potatoes, white potatoes, white beans, tomato products (paste, sauce, and juice), beet greens, soybeans, lima beans, spinach, lentils, and kidney beans.
- Dietary fibre from vegetables, as part of an overall healthy diet, helps reduce blood cholesterol levels and may lower the risk of heart disease. Fibre is important for proper bowel function. It helps reduce constipation and diverticulosis. Fibre-containing foods such as vegetables help provide a feeling of fullness with fewer calories.
- Folate (folic acid) helps the body form red blood cells. Women of childbearing age who may become pregnant should consume adequate folate from foods and in addition 400 mcg of synthetic folic acid from fortified foods or supplements. This reduces the risk of neural tube defects, spinal bifida, and anencephaly during foetal development.
- Vitamin A keeps eyes and skin healthy and helps to protect against infections.
- Vitamin C helps heal cuts and wounds and keeps teeth and gums healthy. Vitamin C aids in iron absorption.

Key Ideas

- A food crop can also be anything that is grown specifically for human consumption, either directly or as an ingredient in other foodstuffs
- Food crops can be contaminated during their production, harvesting, post-harvest handling, and storage
- Food crops can be groups using different criteria
- Food crops have several health benefits

Reflection

In this session, we learned about food crops and the health benefits derived from consuming them as food. We studied the types of food crops and cited typical examples. The session also exposed us to the various nutrients contained in the foods that we eat in our meals.

Reflecting on the study, to what extent do you agree or disagree with someone who says, 'My food is my medicine'?

Discussion

- Explain the meaning of food crops in your own words.
- Mention three categories of food crops and give two examples of each category.
- State four health benefits we gain from eating nutritious foods.

SESSION 4: SOIL: VARIETY AND USES

Hello! Dear students, you are welcome to the last session of this unit. Well done! I hope you enjoyed the previous session on pests and their effects on food crops as well as the health benefits of food crops. Were you convinced that 'An apple a day keeps the doctor away'? In this current session, we are going to learn about soil, focusing on the different types and their uses. This session will be fascinating as well. Let us first look at the expected learning outcomes.

Learning outcomes

By the end of this session, you should be able to:

a. Define soil
b. Identify and discuss the types of soil
c. Discuss some importance of soil

Come with me…

Meaning of the term soil

Soil is the loose surface material consisting of inorganic particles and organic matter that covers most of the land surface. Soil provides the structural support and the source of water and nutrients for plants used in agriculture.

Soils vary greatly in their chemical and physical properties, which depend on their age and on the conditions (parent material, climate, topography and vegetation) under which they were formed.

Processes such as leaching, weathering and microbial activity combine to make a whole range of different soil types, each of which has particular strengths and weaknesses for agricultural production.

Inorganic component of soil

Inorganic material is the major component of most soils. It consists largely of mineral particles with specific physical and chemical properties that vary depending on the parent material and conditions under which the soil was formed. The inorganic component of soils determines soil physical properties such as texture and has a large effect on structure, density and water retention.

Organic component of the soil
Garden soil contains decayed plant and animal parts. This is often known as humus. The following activity demonstrates this property of soil.

Suggested activity
Things needed: garden soil, water, stirrer, transparent container/bottles

Activities:

- Supervise learners in groups to pour samples of garden soil into the transparent containers
- Ask them to add water and stir
- Allow them to settle
- Guide them to observe the particles that are suspended on the surface of the containers.

Observation: dead plant and animal parts are found suspended on the surface of the water.

Conclusion: soil contains organic matter.

Soil Texture
The texture of the soil is a property which is determined largely by the relative proportions of inorganic particles of different sizes.

Soil is the material found on the surface of the earth that is composed of minerals and organic matter. Sand, silt, and clay are the mineral particles derived from rock broken down over thousands of years by climatic and environmental conditions (rain, glaciers, wind, rivers, animals, etc). The largest, coarsest mineral particles are sand**.** These particles are 2.00-0.05 mm in diameter and feel gritty in your fingers. Silt particles are 0.05-0.002 mm and feel like flour. Clay particles are extremely fine -- smaller than 0.002 mm -- feel sticky in your fingers when wet, and clump to the point that you can't see an individual particle without a microscope. Organic matter is the decayed remains of once-living plants and animals. Good plant growth and development depend on the mineral and nutrient content of the soil, as well as its structure.

Suggested Activity
Collect soil from different sources
Ask learners to feel each of them and describe them using the information about the soil types below.

Types of soil

- **Sandy Soil**
  Sandy soil consists of small particles of weathered rock. Sandy soils are one of the poorest types of soil for growing plants because it has very low nutrients and poor water-holding capacity, which makes it hard for the plant's roots to absorb water. This type of soil is very good for the drainage system. Sandy soil is usually formed by the breakdown or fragmentation of rocks like granite, limestone, and quartz.

- **Silt**

Silt, known to have much smaller particles compared to sandy soil is made up of rock and other mineral particles that are smaller than sand and larger than clay. It is the smooth and quite fine quality of the soil that holds water better than sand. Silt is easily transported by moving currents, and it is mainly found near rivers, lakes, and other water bodies. Silt is fertile and used in agricultural practices to improve soil fertility.

- **Clay Soil**
  Clay is the soil with the smallest particle among the other two types of soil. The particles in this soil are tightly packed together with each other with very little or no airspace. This soil has very good water storage qualities and makes it hard for moisture and air to penetrate it. It is very sticky to the touch when wet, but smooth when dried. Clay is the densest and heaviest type of soil. It does not drain well or provide space for plant roots to flourish.

- **Loamy Soil**
  Loam is the fourth type of soil. It is a combination of sand, silt, and clay such that the beneficial properties of each are included. For instance, it can retain moisture and nutrients; hence, it is most suitable for farming. This soil is also referred to as agricultural soil as it includes equilibrium of all three types of soil materials: sandy, clay, and silt, and it has humus. Apart from these, it also has higher calcium and pH levels because of its inorganic origins

Importance of soil

Soil functions are general capabilities of soils that are important for various agricultural, environmental, nature protection, landscape architecture and urban applications. Six key soil functions are:

- Food and other biomass production
- Environmental Interaction: storage, filtering, and transformation
- Biological habitat and gene pool
- Source of raw materials
- Physical and cultural heritage
- A platform for man-made structures: buildings, highways

(International Soil Reference and Information Centre, n.d)

More specifically, soil is part of a plant's life support system. Soils provide anchorage for roots, and hold water and nutrients. Soils are home to a myriad of microorganisms that fix nitrogen and decompose organic matter, and armies of microscopic animals as well as earthworms and termites. We build on the soil as well as with it and in it. Soil plays a vital role in the Earth's ecosystem. Without soil, human life would be very difficult. Soil:

- provides plants with a foothold for their roots and holds the necessary nutrients for plants to grow
- filters the rainwater and regulates the discharge of excess rainwater, preventing flooding
- can store large amounts of organic carbon
- buffers against pollutants, thus protecting groundwater quality

- provides Man with some essential construction and manufacturing materials, we build our houses with bricks made from clay, and we drink water from a cup that is essentially backed soil (clay)

Key Ideas

- Soil is the loose surface material consisting of inorganic particles and organic matter that covers most of the land surface
- The types of soil are sand, silt, clay and loam.
- The soil type that mostly supports the growing of crops is loam soil.
- Soil supports plant growth and serves as the habitat for both micro and macro-organisms.

Reflection

In this session, we have been looking at soil. We discussed what soil is, and identified the components of soil. We went on to discuss the main types of soil and some importance of soil**.** Have you seen any unused parcel of land around you? Can you check the type of soil it has and possibly explore the possibility of using it for agricultural purposes?

Discussion

What characteristics of soil will you consider as good for growing a particular common crop in your locality?

In this session, we have been looking at soil. We discussed what soil is, and identified the components of soil. We went on to discuss the main types of soil and some importance of soil**.**

UNIT 4: FOOD CARE AND PERSONAL HYGIENE

You are welcome to unit three of food care and personal hygiene. In the previous unit, we considered the health benefits of food crops. We established that the growth and internal defense mechanisms against diseases and infections depend to a large extent on the food we eat. This unit deepens our knowledge in the variety of nutrient sources available, the possibility of food poisoning and how to handle and preserve them well, in order to stay healthy. Eating food which is properly cared for is not enough. There are other things you need to do personally to ensure total well-being. One of them is the concept of personal hygiene. to be conscious of the hygiene This is what is referred to as personal hygiene. Stay with me- throughout this trip as we take off shortly.

Learning outcomes

After studying this unit, you will be able to: 1. explain what nutrition and health is; 2. explain what food-borne illness (food poisoning) is; 3. describe what food processing and preservation methods are; 4. identify the elements of personal hygiene; 5. identify the components of personal hygiene; 6. plan for the improvement of personal hygiene

SESSION 1: HEALTH AND NUTRITION

Dear students welcome to the first session of the first unit of the module in Health, Safety, and Social Issues in Early Childhood Education. As you remember from the overview, the first topic we are going to look at is the meaning of the concept of nutrition and its importance in the life of a young child. We want to look at this topic first to lay the foundation of our discussion on which we will build further ideas.

Learning outcomes

By the time you fully go through this session, you will be able to clearly explain:

a. nutrition, Malnutrition
b. the purpose of nutrition
c. classes of nutrients

What is health?

Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. This means that health is a resource to support an individual's function in wider society, rather than an end in itself. A healthful lifestyle provides the means to lead a full life with meaning and purpose.

Meaning of nutrition

Food is important for life. We need to have enough food to be healthy and active. The foods we eat should also be safe and rich in all the nutrients our body needs. It is a basic responsibility for every parent, caregiver, or teacher to provide nourishing food that is clean, safe, and developmentally appropriate on daily basis for children. We should choose from a wide variety of foods, and we should eat them regularly, in their right proportions, throughout the day. We should not forget that we should also enjoy the food that we eat; it should look, smell and taste good.

Before we try to look for the definition of nutrition, I want you to write down what you think happens to the food you eat when it enters your body. Compare your answers to this one:
When we eat any food, it is broken down in the body and the nutrients in it are taken up by the body for energy, growth and repair of tissues. In other words, nutrition refers to the process that results in the body's intake and use of the needed nutrients from the food we eat. How does your answer compare with mine?

Now let us look at three definitions of nutrition from different sources:
The Cambridge Advanced Learner's Dictionary & Thesaurus defines nutrition as the process by which the body takes in and uses food, esp. food that it needs to stay healthy, or the scientific study of this process. Nutrition is the assimilation by living organisms of food materials that enable them to grow, maintain themselves, and reproduce (Carpenter, Truswell, & Esmond, 2020). Nutrition is the provision of adequate energy and nutrients (in terms of amount and mix and timeliness) to the cells to enable them to perform their physiological function (growth, reproduction, defense, repair, etc).
The first two definitions portray nutrition as an avenue for the body to obtain nutrients to carry out its physiological functions. The third definition, however, introduces the ideas of the 'amount', 'mix', and 'timeliness', implying that certain conditions have to be in place for our bodies to derive the optimal benefit from the food we eat. So, what happens if one does not eat the right amount and mix (balance) of food? For example, if someone, gets too little or too much nutrition? Malnutrition is the result. Malnutrition is the result of a lack or an excess in the provision of energy and/or nutrients to the body. Malnutrition includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and the resultant diet-related non-communicable diseases (WHO, 2018).

Pause and reflect: After going through the above definitions, what do you understand by the terms nutrition and malnutrition? What about assimilation?
Let us now turn to our next expected learning outcome.

Purpose of nutrition
As mentioned above, the food we eat every day gives the nutrients we need to live. These food constituents comprise the macronutrients, namely protein, carbohydrate, and fat – that offer calories as well as play specific roles in keeping our health. Micronutrients, such as vitamins and minerals, don't provide energy but serve a diversity of critical functions to ensure our bodies function as optimally as possible (Annigan & Media, 2018). Did you take notice of the two main groups of nutrients and their examples? Would you want to highlight them in your book? I hope in your previous reflection, you realized that assimilation refers to the body's use of nutrients. For what?
Without good nutrition, children and young people cannot develop their potential to the full, and adults will have difficulty doing their best.

Food provides our bodies with what they need to:

- stay alive, be active, move and work;
- build new cells and tissues for growth;
- stay healthy and heal themselves;
- prevent and fight infections (Republic of Zambia, 2018).

Classes of nutrients

- **Protein**
  Houses are built with blocks. One block on the other and mighty houses are built. The building block of this nutrient is called an amino acid and is a component of all our cells. As part of muscle, bone, and skin tissue, it supports our body's structure. It also repairs these tissues if they become damaged and provides antibodies (substances in the body that identify and 'arrest' foreign harmful substances) and other immune cells to cope with inflammation and infection. So you see, our body's soldiers are even made of proteins! Interesting! Our dietary protein helps create hormones and enzymes to keep your cellular machinery running smoothly. Finally, this macronutrient can serve as a fuel source if other calorie sources are unavailable. Proteins can be found in meats, milk, eggs, soy, legumes and whole grains to supply our bodies with a pool of amino acids.
  Pause and reflect: what are hormones? What are enzymes? Proteins are responsible for creating all of that?

- **Carbohydrate**
  Fuel is to cars as carbohydrate is to the body. Think of that! The main purpose of the carbohydrates in the foods we eat is to provide energy to fuel our activities. The energy comes from the breakdown of starches and sugars to their simplest forms, which our cells can then convert to usable power. These simple forms are called glucose molecules. Although protein and fat can also supply us with energy, our cells prefer the calories from carbohydrates. In fact, some of our organs such as the brain and kidneys, for example have a specific need for a carbohydrate fuel source. Some carbohydrates pass through our system undigested, and this dietary fiber provides no calories but can improve our gastrointestinal health (think of the stomach and intestines). Can you mention some sources of carbohydrates?

  Carbohydrates can be found in potatoes, cassava and cocoyam; whole grains such as oats, barley, brown rice, and millet; super sweet fruits such as bananas, melons, grapes and starchy vegetables like corn and pea.

- **Fat**
  If you had three food substances: carbohydrate, protein and fat; and you had the option of eating just one for a long day's trip, which one would you go for? Here is what to consider. Fat provides more than twice the calories per gram as protein or carbohydrate and, as such, is a highly concentrated source of energy our body stores for later use. What is it used for? It provides structure to cell membranes and cushions our internal organs to help prevent damage to tissues. Fat serves as a vehicle for transporting fat-soluble vitamins, and it can also store these nutrients as insurance against a deficiency. Dietary fats can come from both animal and plant sources, with plant-based foods, nuts, and fish offering a healthier version of this nutrient than that found in animal sources such as beef and full-fat milk products. Although fat is important, too much can be bad for our health. We must limit our total fat

intake to 20 to 35 percent of our daily calories. We should aim to meet our fat requirements from unsaturated fats, such as nuts, butter, seeds, avocado, and olive oil (Boyers, 2018).

- **Vitamins**
  Our body needs vitamins to grow and develop. There are 13 vitamins in total, categorized by how our body absorbs them. The fat-soluble vitamins, which include vitamins A, D, E, and K, need fat to be absorbed properly. The water-soluble vitamins -- vitamin C and the B vitamins, which include vitamin B-6, vitamin B-12, thiamine, niacin, folic acid, riboflavin, pantothenic acid and biotin -- dissolve in water before entering your bloodstream. The recommended daily value for each vitamin differs, but it is important to consume all the vitamins each day to keep your body healthy (Boyers, 2018).

- **Minerals**
  Like vitamins, minerals are substances that allow our body to grow and develop properly. Minerals are divided into two classes based on how much of each nutrient our body needs. Our body needs the major minerals – calcium, sodium, potassium, phosphorus, magnesium, sulphur, and chloride – in large amounts, while the trace/minor minerals – copper, fluoride, zinc, iron, chromium, selenium, iodine, molybdenum and manganese – are needed in small amounts. The exact amount needed by the body varies by mineral (Boyers, 2018).

- **Water**
  Much of our body consists of water, and we use it in so many reactions within our cells, water is more essential than any other nutrient. It is a major nutritional element that helps regulate body temperature, lubricate our joints and protect our major organs and tissues. Water also helps transport important substances, like oxygen, throughout our bodies. In addition, our body can lose water quite easily, from urination, perspiration, and evaporation, and we, therefore, need to replace it on a continual basis. Losing only 1 to 2 percent of our body's water weight can result in weakness and fatigue, while a 10 percent loss of our body's water can lead to life-threatening heat stroke. Most adults need to consume between 2 and 3 liters of water each day, although you may need more in hot weather or if you are physically active. It is recommended that children aim to drink about 6-8 glasses of water per day.

Activity

Arrange a visit to the school's canteen or kitchen with your pupils
Assist them to identify the food substances they find
Guide them to group them according to the food nutrients discussed in this study

Key Ideas

- Nutrition is the provision of adequate nutrients in their right proportions at the right time
- Malnutrition –the condition in which the body lacks, receives inadequate or excess amount of food nutrients.
- Each food nutrient has a specific function in the body

- The food nutrients include carbohydrates, proteins, fats and oil. Other nutrients are vitamins, minerals and water

Reflection

Do we eat to grow, or we grow to eat? Interesting!

In this session, we looked at nutrition as a process and how relevant it is to us in our daily living especially as we relate with children in our capacities as teachers and parents in our communities. We need to be able to help ourselves and others.

Discussion

Define nutrition in your own words.

Explain the main function of carbohydrates in the body.

Give two examples of fat-soluble vitamins.

SESSION 2: FOOD-BORNE ILLNESS (FOOD POISONING)

This session is a follow-up to session 1 in which we considered the purpose of nutrition. Another needful thing is to be mindful of how to handle what we eat to reduce risks of diseases some of which are linked to the food we eat. In this session, we shall look at food-borne illnesses (illnesses due to food poisoning). This session will also continue to take you through the symptoms of food poisoning and its causes. Lastly, we will discuss how food gets contaminated and look at the prevention of food poisoning.

Learning outcomes

By the end of this session the students will be able to;

- Describe food-borne illness (food poisoning);
- explain the various symptoms of food poisoning;
- explain the causes of food-borne illness;
- analyse the prevention scheme for food poisoning at home.

Come with me… …

What is food poisoning?

Foodborne illness, more commonly referred to as food poisoning, is the result of eating contaminated, spoiled, or toxic food. The most common symptoms of food poisoning include nausea, vomiting, and diarrhoea.

Food poisoning symptoms

If you have food poisoning, chances are that it won't go undetected. Symptoms can vary depending on the source of the infection. The length of time it takes for symptoms to appear also depends on the source of the infection, but it can range from as little as 1 hour to as long as 28 days. Common causes of food poisoning will typically include at least three of the following symptoms:

- Abdominal cramps: Abdominal pain is pain that occurs between the chest and pelvic regions. Abdominal pain can be crampy, achy, dull, intermittent, or sharp. It's also called a stomach ache.
- Diarrhoea: It is a condition in which faeces are discharged from the bowels frequently and in a liquid form.
- Vomiting: Vomiting, or throwing up, is a forceful discharge of stomach contents. It can be a one-time event linked to something that doesn't settle right in the stomach.
- Loss of appetite: Anorexia is a general loss of appetite or a loss of interest in food. When some people hear the word "anorexia," they think of the eating disorder anorexia nervosa. But there are differences between the two.
- Mild fever: Simply stated, a fever is a natural defense mechanism, usually triggered by infection. The increase in body temperature triggers some internal processes designed to destroy bacteria and germs that will make you sick. This is why it is important not to suppress a fever.
- Weakness: Asthenia, also known as weakness, is the feeling of body fatigue or tiredness. A person experiencing weakness may not be able to move a certain part of their body properly. Asthenia is best described as a lack of energy to move certain muscles or even all muscles in the body.
- Headaches: A headache is a very common condition that causes pain and discomfort in the head, scalp, or neck.

What causes food poisoning?

Most food poisoning can be traced to one of the following three major causes:

- Bacteria: Bacteria is by far the most prevalent cause of food poisoning. When thinking of dangerous bacteria, names like E. coli, Listeria, and Salmonella come to mind for good reason. Salmonella is by far the biggest culprit of serious food poisoning cases in the United States.
- Parasites: Food poisoning caused by parasites is not as common as food poisoning caused by bacteria, but parasites spread through food are still very dangerous. Toxoplasma is the parasite seen most often in cases of food poisoning. It's typically found in cat litter boxes. Parasites can live in your digestive tract undetected for years. However, people with weakened immune systems and pregnant women risk serious side effects if parasites take up residence in their intestines.
- Viruses: Food poisoning can also be caused by a virus. The norovirus, also known as the Norwalk virus, causes over 19 million cases of trusted Source of food poisoning each year. In rare cases, it can be fatal. sapovirus, rotavirus, and astrovirus bring on similar symptoms, but they're less common. Hepatitis A virus is a serious condition that can be transmitted through food.

How does food become contaminated?

Pathogens can be found in almost all the food that humans eat. However, heat from cooking usually kills pathogens on food before it reaches our plate. Foods eaten raw are common sources of food poisoning because they don't go through the cooking process. Occasionally, food will come in contact with the organisms in fecal matter. This most commonly happens when a person preparing food

doesn’t wash their hands before cooking. Meat, eggs, and dairy products are frequently contaminated. Water may also be contaminated with organisms that cause illness.

Prevention of food poisoning at home

To prevent food poisoning at home:

- Wash your hands, utensils, and food surfaces often. Wash your hands well with warm, soapy water before and after handling or preparing food. Use hot, soapy water to wash utensils, cutting boards, and other surfaces you use.

- Keep raw foods separate from ready-to-eat foods. When shopping, preparing food or storing food, keep raw meat, poultry, fish, and shellfish away from other foods. This prevents cross-contamination.

- Cook foods to a safe temperature. The best way to tell if foods are cooked to a safe temperature is to use a food thermometer. You can kill harmful organisms in most foods by cooking them to the right temperature.

- Refrigerate or freeze perishable foods promptly within two hours of purchasing or preparing them. If the room temperature is above 90 F (32.2 C), refrigerate perishable foods within one hour.

- Defrost food safely. Don't thaw food at room temperature. The safest way to thaw food is to defrost it in the refrigerator. If you microwave frozen food using the "defrost" or "50% power" setting, be sure to cook it immediately.

- Throw it out when in doubt. If you aren't sure if a food has been prepared, served, or stored safely, discard it. Food left at room temperature too long may contain bacteria or toxins that can't be destroyed by cooking. Don't taste food that you're unsure about just throw it out. Even if it looks and smells fine, it may not be safe to eat.

Key Ideas

- Food poisoning is a condition of the body that results from eating contaminated, spoiled, or toxic food.
- Symptoms of food poisoning include abdominal cramps, nausea, diarrhea and mild fever
- Food poisoning is preventable
- If you are not sure of the safety of what you want to eat the safest approach is to discard it

Reflection

This session helped you to understand what food poisoning is. The session also reminded you of certain dos and don’ts to prevent food poisoning. The symptoms, causes, and how food is contaminated were described in this session. Lastly, the prevention of food poisoning at home was also explained.

Discussion Discuss with your pupils, six ways of preventing food poisoning in the school

SESSION 3: FOOD PROCESSING AND PRESERVATION METHODS

In this session, we shall look at what food processing and preservation methods are. We will also look at the various methods used for food processing and preservation. We will also discuss the reasons and consequences of food processing.

Learning outcomes

By the end of this session the students will be able to;

- describe what food processing is;
- explain the various methods of food processing;
- explain the reasons and consequences of food processing;
- describe what food preservation is;
- identify the methods of food preservation.

Come with me …

What is food processing?

Food processing is any method used to turn fresh foods into food products. This can involve one or a combination of various processes including washing, chopping, pasteurizing, freezing, fermenting, packaging, cooking, and many more. Food processing also includes adding ingredients to food, for example, to extend shelf life.

What are the methods of food processing?

Food processing includes traditional (heat treatment, fermentation, pickling, smoking, drying, curing) and modern methods (pasteurization, ultra-heat treatment, high-pressure processing, or modified atmosphere packaging). Some of the common methods are described below:

- Canning: A method of preserving food by heating it to a high temperature and then storing it in an air-tight container/can.

- Fermentation: The breakdown of sugars by bacteria, yeasts, or other microorganisms under anaerobic conditions. This means, no oxygen is needed for the process to take place (apart from oxygen present in sugar). Fermentation is notably used in the production of alcoholic beverages such as wine, beer, and cider, and the preservation of foods such as dry sausages, and yogurt, but also for raising dough in bread production.

- Freezing: Food temperatures are reduced to below 0°C to decrease the activity of harmful bacteria. The process can be used to preserve most foods including fruits, vegetables, meat, fish, and ready meals.

- Modified atmosphere packaging: Air inside a package is substituted by a protective gas mix, often including oxygen, carbon dioxide, and nitrogen – gases that are also present in

the air we breathe. They help to extend the shelf life of fresh food products - usually fruits, vegetables, meat, meat products, and seafood.

- Pasteurization: Food is heated and then quickly cooled down to kill microorganisms. For example, raw milk may contain harmful bacteria that cause foodborne illnesses. Boiling it (at home) or pasteurizing it (on a large scale) is crucial to ensure it is safe to consume. Apart from dairy products, pasteurization is widely used in the preservation of canned foods, juices, and alcoholic beverages.

- Smoking: A process of heat and chemical treatment of food to help preserve it by exposing it to smoke from burning material such as wood. Smoked foods usually include types of meat, sausages, fish, or cheese.

- Additives: Food additives play an important role in preserving the freshness, safety, taste, appearance, and texture of processed foods. Food additives are added for the purposes of ensuring food safety or maintaining food quality during the shelf-life of a product. For example, antioxidants prevent fats and oils from becoming rancid, while preservatives prevent or reduce the growth of microbes (e.g. mold on bread). Emulsifiers are used for instance in improving the texture of mayonnaise or stopping salad dressings from separating into oil and water.

What are the reasons and consequences of food processing?

- **Makes food edible:** Grain crops, for example, wheat and corn, are not edible in their natural state. Processing techniques, such as milling and grinding, turn them into flour, after which they can be made into loaves of bread, cereals, pasta, and other edible grain-based products

- **Safety, shelf life, and preservation:** Processing improves or even ensures food safety by removing harmful microorganisms. The main methods are pasteurization, air-tight packaging, and the use of preservatives.

- **Nutritional quality:** Food processing can affect the nutritional quality of foods in both ways: it can enhance it, for instance by adding components that were not present, like vitamin D (through 'fortification'), or by lowering fat, salt, or sugar. It can also cause some fibre and vitamins and minerals to be lost, for example through excessive refining, heating, or freezing.

- **Convenience:** Processing and packaging technologies help to answer modern-day time constraints by providing a range of convenient foods: ready meals, bagged salads, sliced and canned fruits and vegetables that take little time to prepare and can be consumed "on the go".

- **Price:** Food processing can decrease the cost of foods. For example, frozen vegetables have a similar nutritional value as that of fresh ones, but at a lower price, as they have already been prepared, do not contain inedible parts, can be bought in bulk, and can last

longer. This way, processing increases the shelf life of food, and decreases the amount of waste, reducing thereby the overall costs of food production.

What is food preservation?

Food preservation is known "as the science which deals with the process of prevention of decay or spoilage of food thus allowing it to be stored in a fit condition for future use". Preservation ensures that the quality, edibility, and nutritive value of the food remain intact. Preservation involves preventing the growth of bacteria, fungi, and other microorganisms as well as retarding the oxidation of fats to reduce rancidity. The process also ensures that there is no discoloration or aging. Preservation also involves sealing to prevent the re-entry of microbes. Food preservation ensures that food remains in a state where it is not contaminated by pathogenic organisms or chemicals and does not lose optimum qualities of colour, texture, flavor, and nutritive value.

Preservation Methods

- Drying; It is the oldest method of food preservation. This method reduces water activity which prevents bacterial growth. Drying reduces weight so food can be carried easily. Sun and wind are both used for drying as well as modern applications like Bed dryers, Fluidized bed dryers, Freeze Drying, Shelf dryers, Spray drying, Commercial food dehydrators, and Household oven. Meat and fruits like apples, apricots, and grapes are some examples of drying with this method.

- Freezing: It is keeping prepared food kinds of stuff in cold storage. Potatoes can be stored in dark rooms but potato preparations need to be frozen.

- Smoking: It is the process that cooks, flavours, and preserves food exposing it to the smoke from burning wood. Smoke is antimicrobial and antioxidant and most often meats and fish are smoked. Various methods of smoking are used like Hot smoking, Cold smoking, Smoke roasting, and Smoke baking. Smoking as a preservative enhances the risk of cancer.

- Vacuum packing: It creates a vacuum by making bags and bottles airtight. Since there is no oxygen in the created vacuum, bacteria die. Usually used for dry fruit.

- Salting and Pickling: Salting also known as curing removes moisture from foods like meat. Pickling means preserving food in brine (salt solution) or marinating in vinegar (acetic acid) and Asia, oil is used to preserve foods. Salt kills and inhibits the growth of microorganisms at 20% of concentration. There are various methods of pickling like chemical pickling and fermentation pickling. In commercial pickles, sodium benzoate or EDTA is added to increase shelf life.

- Sugar: It is used in syrup form to preserve fruits or in the crystallized form if the material to be preserved is cooked in the sugar till crystallization takes place like candied peel and ginger. Another use is for glazed fruit that gets a superficial coating of sugar syrup. Sugar is also used with alcohol to preserve luxury foods like fruit in brandy.

- Canning and bottling mean sealing cooked food in sterile bottles and cans. The container is boiled and this kills or weakens bacteria. Foods are cooked for various lengths of time. Once the can or bottle is opened the food is again at risk of spoilage.

- Jugging: It is preserving meat by stewing it in an earthenware jug or casserole. Brine or wine is used to stew meat in and sometimes the animal's blood.

- Burial in the ground preserves food as there is a lack of light and oxygen and it has cool temperatures, pH levels, or desiccants in the soil. Used to preserve cabbages and root vegetables.

- Pulsed Electric Field Processing is a new method of preservation that uses brief pulses as a strong electric field to process cells. This is still at an experimental stage.

- A modified atmosphere preserves food by operating on the atmosphere around it. Salad crops that are difficult to preserve are packaged in sealed bags with an atmosphere modified to reduce the oxygen concentration and increase the carbon dioxide concentration.

Key Ideas

- Food processing is the process of changing or transforming raw food materials into consumable forms or products.
- Food processing offers many advantages such as prolonging the life span of the food, preventing food from going bad, easy packaging, etc.
- Food preservation is the process of using certain methods to prevent food from going bad or from microorganisms growing on it.
- Some of the methods of food preservation are drying, smoking, salting, drying, canning and freezing.

Reflection

This session helped you to understand what food processing and preservation methods are. We considered several approaches—both indigenous and modern—that can be used to both process and preserve food. Can you identify with any of these approaches in Ghana? Which ones are no longer commonly used?

Discussion

Discuss how our grandmothers and fathers who had no access to supermarkets and fridges were still able to keep their food in good and healthy states. In what ways have modernity improved such practices?

SESSION 4: PERSONAL HYGIENE: MEANING, CLEANLINESS AND HYGIENE, IMPORTANCE

In this session, we shall consider the meaning of personal hygiene. We will also look at its importance to public health. At the end of the lesson, we will talk about the negative effects of poor personal hygiene. Brace yourself up as we finish this module with this session

Learning outcomes

By the end of this session the students will be able to;

- describe what personal hygiene is;
- identify the importance of personal hygiene to public health;
- elaborate on the negative effects of poor personal hygiene.

Come with me …

What is personal hygiene?

Personal hygiene is a concept that is commonly used in medical and public health practices. It is also widely practiced at the individual level and at home. It involves maintaining the cleanliness of our bodies and clothes. Personal hygiene is personal, as its name implies. In this regard, personal hygiene is defined as a condition promoting sanitary practices to the self. Everybody has the habits and standards that they have been taught or that they have learned from others. Generally, the practice of personal hygiene is employed to prevent or minimize the incidence and spread of communicable diseases.

Difference between cleanliness and hygiene

The term cleanliness should not be used in place of hygiene. Cleaning in many cases is removing dirt, wastes, or unwanted things from the surface of objects using detergents and necessary equipment. Hygiene practice focuses on the prevention of diseases using cleaning as one of several inputs. For example, a janitor cleans the floor of a health center using detergent, a mop, and a broom. They might also use chlorine solution to disinfect the floor. The cleaning process in this example is the removal of visible dirt, while the use of chlorine solution removes the invisible microorganisms. The hygienic practice encompasses both cleanings for the removal of physically observable matters and the use of chlorine for the removal of microorganisms. The hygiene practice in this example aims at preventing the spread of disease-causing organisms. Cleaning is a means to achieve this task.

Public health importance of personal hygiene

The knowledge and practice of personal hygiene are vital in all our everyday activities. The purposes are:

- Preventing faeco-orally transmitted diseases: The fingers may get contaminated with one's faeces, either directly or indirectly. Activities during defecation and child bottom-washing are additional opportunities for the contamination of the fingers that facilitate the transmission of infections.

- Aesthetic values of personal hygiene: A person with clean hands is proud while eating because they feel confident about preventing diseases. A teacher in a school is always

happy to see their students with clean faces and eyes and dressed in clean clothes. A mother is mentally satisfied to feed her infant with clean hands because she ensures the preservation of her child's health. Generally, cleaning oneself produces pride, comfort, and dignity at home and in public places. Caring about the way you look is important to your self-esteem.

- Social impact: A person with poor personal hygiene might be isolated from friendship because telling the person about the situation might be sensitive and culturally difficult. The success of a job application or the chance of promotion could be affected by poor personal hygiene; no company wants to be represented by someone who does not appear to be able to look after themselves.

Negative effects of poor personal hygiene

Poor hygiene is a sensitive topic, and talking to a person about it can be difficult. As a result, a person with poor personal hygiene could become isolated from other people. Poor personal hygiene may also affect the workplace. Companies may be more likely to offer jobs trusted sources and promotions to individuals who appear to take care of their health and presentation. Poor personal hygiene can be a particularly problematic trustee Source in the food industry.

There are also many health implications of having poor personal hygiene, the following as hygiene-related diseases:

- Athlete's foot: Athlete's foot is a fungal infection that affects the upper layer of the skin of the foot, especially when it is warm, moist, and irritated.
- Body lice: Lice are parasites that live on the skin. Most are harmless to overall health, but they cause tiny bites, which can be bothersome.
- Chronic diarrhoea: Diarrhoea occurs when a person has loose or watery stools. Many different conditions have diarrhoea as a symptom.
- Tooth decay: Cavities are small holes in the teeth caused by decay. Several home remedies can prevent this decay or stop it before it forms a cavity.
- Head lice: Head lice are tiny, wingless, parasitic insects that live in human hair. They are a common problem and highly contagious. They can also be hard to get rid of. The eggs are known as nits.
- Hot tub rash: Hot tub folliculitis, or pseudomonas folliculitis, is a skin infection that results from bacteria called Pseudomonas aeruginosa. The infection is usually the result of using poorly maintained hot tubs.
- Pinworms: The pinworm, also known as threadworm, is a very common intestinal parasite. The medical condition associated with pinworm infestation is known as enterobiasis.
- Pubic lice: Pubic lice, also known as crab lice or crabs, are tiny, parasitic insects that feed on blood. They spread easily and cause itching and red spots.
- Scabies: Scabies is one of several skin conditions that can cause itching and rashes. It is a dermatologic condition caused by Sarcoptes scabiei, an eight-legged microscopic mite.
- Swimmer's ear: Swimmer's ear is an infection that can occur after spending a long time in the water or outdoors in the wind and rain. It affects the skin that covers the outer ear canal, which leads to the eardrum.

- Ringworm: Ringworm, or tinea, refers to several types of contagious fungal infections of the top layer of the skin, scalp, and nails.

Key Ideas

- personal hygiene is defined as a condition promoting sanitary practices to the self.
- Hygiene embodies cleanliness
- The knowledge and practice of personal hygiene are vital in all our everyday activities
- Poor personal hygiene affects not just the people who struggle with it but the people around them too.

Reflection

An aspect of hygiene has been our focus in this unit. After explaining the concept, I tried to situate cleanliness in hygiene. We learned that promoting good sanitation enures to the benefit of individuals. This is the concept of personal hygiene. We owe it a responsibility to first practise it and assist our pupils to do the same. The starting point is to let the younger generation see what we expect from them in us.

Discussion

What is the relationship between cleaning and hygiene?

In what ways can you assist your pupils to improve on their personal hygiene practices?