BEC3202 INTEGRATED SCIENCE

PHILISOPHY OF SCIENCE

Philosophy

Derived from Greek word 'philosophia' meaning *love of knowledge*

Its is also described as the *pursuit of knowledge for its own sake*

Philosophy of science

Refers to the analysis of scientific knowledge empirically, based on experimental experience.

It focuses on fundamental issues /questions like: what is science? What is the nature of science?, how do scientist construct personal knowledge from experience?.

In teaching and learning situation, philosophy of science explores issues on a learner's perceptions about specific scientific concepts, methods and skills acquired in science. E. G concepts of traditional beliefs about weather, discussion and observation.

WHAT IS SCIENCE

- A branch of study that is concerned with intellectual and practical activity encompassing the systematic study of the structure and behavior of the physical and natural world through observation and experiment (OXFORD DICTIONARY)
- is an interconnected series of concepts and conceptual schemes that have developed as a result of experimentation and observation and are fruitful for further experimentation and observation (JB Conant)
- Is a body of classified, organized and systematized knowledge

Accurate definition

- Science is a search for knowledge through experimentation; a search for knowing and understanding; a questioning of all aspects of the environment; the collection and analysis of data and the interpretation of their significance.

NATURE OF SCIENCE

-refers to the approaches or view of teaching science

There are two views:

a) Static view

Perceives science as a way of explaining the universe in which we live.

It shows that we are already knowledgeable and the world can still benefit from what has been accumulated over the years and pass on generation to generation

Therefore there is no need for further research and we can do science without laboratories

Implications of static view on teaching and learning process

- Assumes that the teacher has all the knowledge to impact to the leaner
- Leaner is seen as empty state tabula rasa to which the teacher must transfer knowledge
- Leaner becomes a passive recipient and has no room to question the teacher
- To the leaner therefore the science becomes a group of facts that are best learned by memorization this is jug-mug type of teacher learner relationship

Strengths of the static view

- It is cheaper way of teaching science since it requires fewer resources
- It has a wider coverage of content areas
- Class control is easy because the teacher is the authority
- Appropriate when the teacher is handling large classes

Weaknesses of static view

- Its teacher centered. Learners are not motivated and thus lack enthusiasm. Thus its boring
- It is limited because its major assumption that knowledge is static is not true. Knowledge is constantly changing, growing and continually being revised.
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b) The dynamic view

- Its view sees science as an activity with the present knowledge being seen as the building blocks onto which further operations can be laid on.
- Science therefore needs laboratories for further investigations and re-examination of new propositions

Implications of dynamic view on teaching and learning processes

- Advocates for learner centered strategies.
- In teaching science, the learner is the focal point of learning as teaching is based on the nature of the learners, stages of development and interest.

- Role of the teacher is to provide a conducive environment which enhances the learners' participation and perception of the ideas or concepts being studied**.**

Strengths of the dynamic view

- Learners are active participants since it is learner-centred.
- There is development and acquisition of many science skills
- Nearly all the scientific attitudes are enhanced.
- Caters for individual differences because the learners advance at their own pace.
- There is room for variety of activities and creativity, making learning more interesting and motivating.
- It enhances the use of teaching and learning aids hence it encourages improvisation.
- It enhances high retention of scientific knowledge since it is activity based.

Weaknesses of the dynamic view

- Consumes a lot of time and may lead to poor coverage of the syllabus.
- Can be expensive if all the materials are to be bought.
- It places heavy task on the teacher's shoulders in terms of looking for the learning materials
- It is difficult to use when handling large classes

SCIENTIFIC SKILLS AND ATTITUDES

A skill is the ability to do something well

Attitude is a pattern of thought, feeling or way of regarding things, objects, situations or persons.

Scientific skills and attitudes are skills used in the process of carrying out scientific experiments or investigations. They include:

I. ***Scientific process skills***
   Are intellectual operations that are used by a scientist to solve problems during scientific investigations
II. ***Manipulative skills***
   Are psychomotor skills that enable the learners to use and carefully handle science apparatus, materials, substances and specimens correctly and carefully

Assignment 1. Discuss the scientific skills to be developed by science teachers in ECD. (10MKS)

SCIENTIFIC ATTITUDES

Refers to predispositions towards science in terms of activities, concepts, methods and process skills.

The task of the teacher is to:

- Try to preserve the useful attitudes which learners already have
- Instill new attitudes which are useful by encouraging their development
- Provide situations which enhance the development of attitudes since they cannot be taught
- Create a classroom climate that gives approval to the behavior that demonstrates the attitudes.

Scientific attitudes include:

Curiosity- it is most important because most children are naturally curious.

Curiosity can enhance learning especially by enquiry, which generates a lot of questions.

The desire to find the answers will encourage the learners to put in more effort.

Young learners deserve to find in schools a nurturing influence for their natural curiosity about the environment around them.

Genuine interest- is self driving force on wanting to learn more about an object.

Teachers must understand the learners to make them feel free to express themselves and ask questions which interest them.

Responsibility- in science it means that learners:

- Do science activities on their own without supervision of the teacher
- Raise genuine and relevant questions and conduct further investigations
- Keep and handle the materials with care
- Continue to work outside the normal class time and complete their homework and assignments

Self confidence

Is what drives one to solve a problem

Science teachers should strengthen this feeling in learners by encouraging them to find answers to problems, recognizing and appreciating their successes and efforts respectively.

Open mindedness

Learners should be encouraged to keep an open mind as they attempt to get closer and closer to the best answer. A person who is open-minded:

- Is willing to change his/her mind in the face of new reliable evidence
- Respects another person's point of view
- Looks at a matter from many sides and concludes only after gathering enough evidence
- Is not superstitious and accepts the fact that nothing happens without some causes.

TOPIC 2. THE HUMAN BODY

- It is the entire structure of organism of human species.
- Average human body has a height of 5-6 feet

Characteristics of human body

- It stands erect
- It works on two feet
- Uses arms to carry and lift objects
- Has thumbs that are able to grasp
- Has millions of cells hundreds of bones and muscles and tenth of organism

TEETH

Adult human beings has 32 teeth

These are incisors, canines, premolars and molars

Types of teeth

(a) Twenty primary teeth

- Begin appearing from 6 months of age to about 2years
- Are comprised of two central incisors two lateral incisors two canines (cuspids) and four molars in the lower jaw and the same layout of teeth in the upper jaw

(b) thirty two permanent teeth

- are formed beneath the primary teeth
- are comprised of of more or less the same lay out two central incisors two literal incisors two canines four pre molars and six molars in the lower and the same in the upper jaw.

Shedding of teeth

It begins at about 6-7 years

Lower and central incisors are the first to be replaced.

Lower central incisors are the first to be replaced

The others are as follows

- the first set of permanent molars grow at the same time as the central incisors but they are not a noticed as the central incisors
- like the first set of permanent molars, the second sets cut through the gum as replacement of the primary teeth
- The third set of the permanent molars does not appear until after 17 years of age. This is because the jaws need time to enlarge to accommodate thirty two teeth.
- The permanent molars which grow after the last primary molars do not replace any other teeth neither are they replaced by other teeth.

FUNCTIONS OF DIFFERENT TYPES OF TEETH

1. **incisors or cutting teeth**

Are eight in number and are the very front human teeth.

They have a flat surface and a sharp horizontal edge for cutting and biting the food

They have one ling, single conical root.

2. **Canines (cuspids)teeth**

They are four canine teeth

They are strong pointed corner teeth for tearing and shredding and are replaced laterally to each lateral incisor

They are larger and stronger than incisors

3. **Premolars or bicuspid teeth**

They are eight in number

They are used for chewing food

They are placed lateral to and behind the canine teeth, with a flat upper surface and 1-2 roots.

4. **Molars or grinding teeth**

They are 12 molars

They are the back human teeth

They have 2-4 roots

They are used for chewing and grinding of food before swallowing

The third set of molars comprises of wisdom teeth.

CARE OF THE TEETH

Teeth should be cared for to prevent dental decay which causes toothache, bad breath and loss of appetite. They can be cared by:

- Brushing them after evening meals and breakfast using a suitable toothbrush and toothpaste.
- Eating foods that contain vitamins A,C, and D as well as minerals. Minerals such as calcium and phosphorus help in development and maintenance of health teeth.
- Also chewing hard type of food like carrots helps exercise jaws and strengthens teeth.
- Visiting a dentist regularly for check ups, even if you have no dental problems
- Avoid damaging the teeth by biting hard substances, holding hot food between the
- teeth.

SENSE ORGANS AND BODY SYSTEMS

1. **Digestive System**

is a complex series of organs and glnads that process food

is a system of converting complex food substances to simple substances which the body can absorb into the blood system for metabolism.

STRUCTURE AND FUNCTION OF THE HUMAN DIGESTIVE SYSTEM

a) Mouth

Digestive process begins in the mouth

Food is partly broken down by the process of chewing and mixed with saliva from the salivary glands

Saliva contains enzyme PTYALIN which converts starch to dextrin and some of it to maltose.

Food is then formed into a ball by the tongue and swallowed where it is passed onto the oesophagus.

b) Oesophagus

Down the oesophagus, food moves by ***peristalsis.*** This is a rhythmic waveline muscle movement that squeezes the food boluses down the oesophagus till they get to the stomach.

c) Stomach

Is a sack like organ where food is stored, churned and mixed with gastric juice
Gastric juice is secreted by the gastric glands in the walls of the stomach.
Food is formed into a thick soup known as ***chime***
Gastric juice contains enzymes rennin, lipase and pepsin.It also contains hydrochloric acid.

- Rennin clots milk
- Lipase emulsifies fat which is in the food
- Pepsin breaks down proteins into peptones and proteose.
- Hydrochloric acid kills germs and provides an acidic environment necessary for enzyme action

Food is held in the stomach for a period of between 1-4 hrs. it is then released into small portions through duodenum into the small intestines.

d) Small intestines

Is a long tube, which allows for a lot of digestion.
Here food is acted upon by pancreatic juice from the pancreas, bile from the liver and intestinal juice from the small intestinal walls.

Bile- contains alkaline bile salts which emulsify fat and active pancreatic lipase.
Pancreatic juice-has three enzymes ***trypsin*** which breaks down protein and peptones to amino acids, ***amylase*** which breaks down starch (polysaccharides) to maltose (disaccharides) and ***lipase*** which splits up fats into fatty acids and glycerol.
Intestinal juice- contains enzymes ***erepsin, amylase, maltose, sucrose*** and ***lipase***. All these enzymes complete the conversion of food into simple and soluble substances which are absorbed into the blood capillaries.
Erepsin- converts proteins (peptidase) to amino acids
Amylase- converts maltose to glucose and galactose
Maltase- converts maltose to glucose
Sucrose- converts sucrose to glucose and fructose
Lipase- converts glycerides to fatty acids and glycerol

ABSORBTION IN SMALL INTESTINES

Small intestine is the longest portion of the digestive tract.
It is 6m long and is located in the middle of the abdomen.
It has 3 sections: the duodenum, the jejunum, and the ileum.

Assignment 1. DISCUSS ABSORBTION OF FOOD BOTH IN THE SMALL AND LARGE INTESTINES. (15MKS)

2. THE BREATHING SYSTEM

Breathing is taking in of oxygen from the air and giving out carbon dioxide from the body.

The breathing system consists of various organs which are involved in the process. These organs include the lungs, nose and the wind pipe (trachea).

FUNCTIONS OF THE BREATHING PARTS

a) **The nose**

Air is taken in through the nose where it is warmed and the hairs inside the nose traps dust particles which may be in the air. If the nose is blocked or a lot of air is required, it is taken in through the mouth.

b) **Trachea (windpipe)**

It is made of gristles or cartilage. It provides a passage way for air to and from the lungs. The cartilage rings prevents collapse of the respiratory tract and keep it open even when the neck is turned.

Inside the trachea, air is cleaned by mucus lining and cilia which trap dust and filters microorganisms. The air is subsequently propelled towards lungs. Air is moistened and warmed as it passes and gets into contact with the warm moist inner surface of the windpipe.

c) Bronchi and Bronchioles

The windpipe branches into two bronchi. Each bronchus branches continuously into smaller and smaller bronchial tubes till the tiny tubes open into clusters of thin walled air sacs.

The air sacs are covered with a dense capillary network.

The tiny tubes contract to vary the inflow or outflow of air because they are made of elastic tissues. Gaseous exchange takes place in the air sacs.

Gaseous exchange takes place in the air sacs. Blood carrying carbon dioxide (co2) is pumped from the heart into the capillaries of the air sacs. The CO2 quickly passes through the thin capillary walls into the air sacs to be exhaled. At the same time, oxygen from the air sacs passes into the capillaries. The red blood cells in the capillaries pick up the oxygen as the blood flows back to the heart via pulmonary vein to be pumped to the rest of the body.

THE BREATHING PROCESS

When breathing in, the muscles between the ribs contract, causing the ribs and sternum to move upwards and outwards. At the same time, the diaphragm contracts and moves downwards thus increase the depth of the chest cavity.

Air is then sucked into the lungs through the nostrils. This is because atmospheric pressure is less in the lungs. The elastic tissues of the lungs stretch and expand due to air filling themas it rushes in through the nose, nostrils, windpipe, bronchi and bronchioles.

When breathing out, the muscles between the ribs and the sternum relax. Diaphragm relaxes and moves upwards. Width and depth of the chest diminishes thus exerting pressure on the lungs, hence the air is expelled out. The air that is inhaled is rich in oxygen and the one breathed out is rich in carbon dioxide.

The breathing rhythm increases speed when one is doing strenuous activity like running because more oxygen is required by the active muscles.

At the same time, the heart beats faster so that as the inhaled air reaches the air sacs, it finds blood with carbon dioxide ready to be exchanged with oxygen takes place and blood moves on.

THE CIRCULATORY SYSTEM

-It is made up of the vessels and the muscles that helps and controls the flow of blood around the body. It includes the Heart, the blood and the blood vessels.

Blood components and functions

An average adult has about 5liters of blood which is about 7.7% of the body weight.

-it carries out the critical function of transporting oxygen and nutrients to body cells and getting rid of carbon dioxide, ammonia and other products.

-it also plays virtual role in the body's immune system and maintain a relatively constant body temperature.

Components of blood

(i) ***Plasma-55% and cells 45%***

It is a pale yellow fluid composed of 90% water 6-7% plasma protein and 0.9% inorganic substance like minerals.

It facilitate transport of the substance stated above, together with the blood cells to the parts of the body where they are required to be.

It also contains blood clotting factors.

(ii) ***Cells or corpuscles***

Blood cells are of the three types.

White blood cells-defend the body against harmful and micro organism (5000-10,000)

Red blood cells transport oxygen and carbon dioxide (4.2-6.4)

Platelets (thrombocytes) are important for normal clothing of blood (250,000-500,000)

TYPES OF BLOOD VESSELES AND THEIR FUNCTIONS

Blood vessels are tubes through which blood flows. They are of three categories

(a) ***Arteries*** convey blood from the heart.

They are made up of strong elastic muscles fibers to withstand the pressure of moving blood as it pumped by the heart.

They branch out forming narrow vessels known as arterials which branch to form network of very small vessels known as capillaries.

(b) ***Veins*** convey blood back t the heart from all over the body they have valves to prevent the backflow of blood because they carry blood under low pressure.

Veins branch out to form ***venules.***

(C)***Capillaries*** are smallest blood vessels.

They are formed at the end of arteries and veins

It is only from the capillaries where blood can release the nutrients and oxygen to the body tissue and take up waste products and carbon dioxide from the tissues.

The other blood vessels which are either arteries or veins are;

(i) ***Aorta*** it is the largest artery in the body.

It receives oxygenated blood from the heart and conveys it to the rest of the body.

It forms various branches to supply blood to the head and other parts of the body

It forms various branches to supply blood to the head and other organism e.g heptic artery to the liver, caliar to the intestine, renal to kidney.

It receives blood from the left ventricle of the heart.

(ii) ***Inferior vena cava*** it's the largest vein in the body it returns the deoxygenated blood to the heart

It forms deoxygenated blood to the heart. It forms branches like renal vein which drain blood from the kidneys

It pours blood into the heart via the right auricle.

(iii) ***Superior vena cava*** it's a vein that brings deoxygenated blood from the head and upper,limbs.

It pours blood into the heart via the right auricle.

(iv) ***Pulmonary artery-***conveys de-oxygenated blood from right ventricle to the heart to the lungs.

(v) ***Pulmonary vein*** conveys oxygenated blood from lungs to the left auricle of the heart.

THE HEART

It is a tough muscular organ with the shape of cone whose apex points downwards towards the left handed side. It act a pump that provide the force necessary to circulate the blood to the tissue in the body.

It has four compartments; two large ones-ventricles surrounded by very tough muscles surrounded at the bottom of the heart.

-Two smaller ones-auricles

FUNCTIONS OF PARTS OF THE HEART

Left ventricle-pumps oxygenated blood out of the heart through the semi-lunar valve into the aorta hence to the rest of the body.

Right ventricle pumps deoxygenated food through the semi lunar valve into the aorta into pulmonary artery to the lungs to be re-oxygenated.

Left auricle receives oxygenated blood from lungs through the pulmonary vein.

Right auricle receives deoxygenated blood from the lower part of the body via inferior vena cava and also from the head and upperparts of the body via the superior vena cava.

3 EXCRETORY SYSTEM

EXCRETION-is the disposal of cell waste products of metabolism e.g urea, water from the lungs, carbon dioxide, salt (sweat) E.T.C

The main excretory organs are-;

(a) **The kidney**

Human body has 2 kidneys

They are solid bean like structure which are broken in colour.

They are enclosed in a transparent membrane and attached to the back of the abdomen

They help to keep the right balance of water in the blood

(b) **The skin** its an excretory organ for sweat.

The sweat glands in the skin remove excess water n salt from the blood.

(c) **The lungs** they help in excreting water n carbon dioxide

4 **THE ENDOCRINE SYSTEM**

It comprises of ductless hormone producing glands. These glands are scattered in the body and they produce chemical messages known as hormones a Greek word meaning “to excite.”

Hormones cause organism or body system to be more active. They are like catalysts

They are release into blood circulation for distribution to all body tissues.

The hormone producing glands are;

(i) Thyroid glands

It is suited in the neck

They produce thyroid hormones which influence the various enzymes involve in all metabolic process

Thyroid gland also affects growth and development of the mind.

(ii) **Pancreases**- it produces digestive juice(coatis, trysin, lipase & amylase)

It produces insulin which passes direct to the blood circulation insulin controls the level o blood sugar. (islets or langarhans)

It increases glycogen formation from glucose.

(iii) Adrenals they lie above the kidney

They produce adrenile hormone which prepares the body for fight or flight incase of danger.

They stop digestion so that more blood can go where it is needed for action.

It stimulates metabolism by increasing the rate of brake down of glycogen to raise blood sugar and respiration.

It increases the rate of heart beat and blood pressure to ensure adequate supply of blood where it is needed.

It also increases coagulability of blood just in case of the apparent danger causes wounds.

It exerts favourable affects on contracting muscles to ensure endurance during the action.

(iv) Ovaries in a female-produce hormones estrogen and progesterone from puberty to menopause. These hormones are not produced during pregnancy they regulate monthly circle.

Oestrogen is released into blood stream during the first half of the circle before ovulation.

Both estrogen and progesterone are the released to the blood stream In the second half of the menstrual cycle.

The two ovaries hormones are responsible for physical changes in adolescent girls.

The large amount of progesterone in the blood helps to maintain pregnancy in the early stages as well as develop the placenta

Placenta reduces its own progesterone that takes over the maintenance of the pregnancy and preparation of mammary glands for lactation

Testes in men

Produce testosterone which controls development of physical changes during the puberty.

It is referred as the male sex hormone. It is released into blood stream to control and maintain reproductive activities until old age.

Pituitary glands –it is a small gland of a pea size situated at hypothalamus of the brain. It is a time referred to as the master gland because it secretes hormones which control other endocrine glands such as adrenal glands thyroid tastes