Objectives:

• To obtain knowledge on the nature and scope of biological science.

• To understand the aims and objectives of teaching of biological science.

• To examine the need and significance of teaching of biological science.

• To explore the values of teaching of biological science.

INTRODUCTION

The science which deals with the study of living objects is called Biology. Thus the subject involves the studies of all kinds of micro-organisms, plants and animals. Biology is related to mankind ever since the origin of man, therefore this branch of science stands first in order of studies as compared to other branches of science. Ever since the origin of life man is eager to know about various phenomenon of life processes such as health and disease, birth, growth and death. However, man depends on plants and animals for food, shelter and clothing which are immediate needs of life, come from Biology. Perhaps it was the elementary need of man to know about the living beings, so that maximum benefits can be drawn out of them. Though biology involves study of life, but now a days it is mostly centralised with the study of agriculture, animal husbandry, health and microbiology and related branches. Today study of any branch of science is not possible in isolation as it also involves principles of physics, chemistry and various other branches. MEANING Biology is a natural science concerned with the study of life and living organisms, including their structure, function, growth, evolution, distribution, identification and taxonomy. Biology literally means "the study of life". Biology is such a broad field, covering the minute workings of chemical machines inside our cells, to broad scale concepts of ecosystems and global climate change. Biologists study intimate details of the human brain, the composition of our genes, and even the functioning of our reproductive system. Human’s exploratory activities have resulted in the accumulation of vast source of knowledge called Biology. In Biology, we study about nature which means the entire universe. The knowledge is now organised in several disciplines for the convenience of study.

Biological Sciences is the study of life and living organisms. It is also called as “Biology”. The Greek word ‘bio’ means life and ‘logos’ means study of. In the late 1700s Pierre-Antoine de Monet and Jean-Baptiste de Lamarck coined the term biology.

Earlier study of living things was restricted to the pure Science like Botany and Zoology that together comprise the Biology. But as the time passed new branches evolved, new technologies developed in pure subjects as well as in applied fields, which gave rise to a very broad science called Biological Sciences.

Biological Sciences is an extensive study covering the minute workings of chemical substances inside living cells, to the broad scale concepts of ecosystems and global environmental changes. It is also concerned with the physical characteristics and behaviors of organisms living today and long ago, how they came into existence, and what relation they possess with each other and their environments. Intimate study of details of the human brain, the composition of our genes, and even the functioning of our reproductive system are dealt in Biological science. Today it is also called by new name- Life sciences.

The life sciences can be defined as “a systematic study of living beings or study of nature”. Teaching of life Science basically deals with providing information about the latest developments in the field of Biological sciences all over the world.

Human knowledge of biology began with prehistoric man and his experiences with plants and animals and also through the instincts and efforts to explore the nature. The information was verbally passed on from one generation to another. The history of science therefore can be said to have begun with the history of human existence.

During early period, people knew about medicinal and poisonous plants and knew that a heartbeat meant that someone or some animal was alive. They also had the idea that the conception of babies is in some way connected with sexual reproduction.

Records of advances made in the field of medicine as well as some other branches were biological sciences during the early civilization are available.

**Some of the important historic contributions in the field of biology are mentioned below:**

In the ancient Hebrew creation account as recorded in the book of Genesis (genesis = origin, birth), the Creator gives the Earth the ability to produce plants and animals. In Genesis 1: 11, the Creator says, “Let the land produce vegetation.” Verse 12 says, “The land produced vegetation.” Genesis 1:24 adds, “Let the land produce living creatures.” These verses stand in sharp contrast to earlier verses which say, “. . . Let there be . . . and it was.” In Genesis 1:28, humans are given the responsibility of taking good care of the creation.

Anaximander, a Greek philosopher who lived from 611 to 546 BC, is credited with the first written work on natural science; a classical poem entitled On Nature. In this poem, he presented what may be the first written theory of evolution he said that in the beginning there was a fish-like creature with scales etc. that arose in and lived in the world ocean. As some of these advanced, they moved onto land, shed their scaly coverings, and became the first humans

Hippocrates lived from about 400 to 300 BC. One of the things for which he is remembered is his theory that the human body was composed of the four elements (earth, air, fire, water) plus four fluids or humors- sanguis or blood, produced by the heart; choler or yellow bile, produced by the liver; melancholia or black bile, produced by the spleen; and phlegma or phlegm, produced by the brain, which corresponded with these.

Aristotle, one of Plato’s most famous pupils, lived from 343 to 322 BC, and contributed much to what we now consider to be in the realm of biology. His refinement of the systems of animal and plant classification has profoundly influenced the course of biological thought ever since.

His classification system included what he called the Scala naturae, the “scale of nature.” He said that all organisms are arranged in a hierarchy from simplest to most complex, like rungs on a ladder with no vacancies, no mobility, and no change possible since all the spots were full.

By the late 1600s, observations were being made with the first, primitive microscopes. In 1665, Robert Hooke was the first person to see and name cells. He examined (dead) cork bark with a primitive microscope and saw little cubicles which he called cells.

Anton van Leeuwenhoek was the first person to observe sperm cells with his very primitive microscope. He thought he saw tiny body parts in the sperm. He used this as “proof” of the idea that the homunculus was in the sperm and the mother’s body just served as a place for the planted seed to grow. Additionally, Leeuwenhoek proposed that fertilization occurs when the sperm enters the egg, but this could not actually be observed for another 100 years.

In the field of botany, there were considerable efforts in the past. Classification of organisms in India comes from Vedas and Upanishads (1500 B.C to 600 B.C). In these books many technical terms were used to describe plants and their parts both morphologically as well as anatomically.

Rotation of crops was practiced and medicinal plants were also collected and studied. Two eminent ancient Indian scholars and Ayurvedic physicians named Charaka and Susruta contributed to our knowledge of diversity and utility of plants. The ancient Indian scholars compiled ‘Vrikshayurveda’ before the beginning of Christian era and this deals with the scientific study of plants and animal life.

Two great Greek philosophers, Hippocrates (460-377 B.C) and Aristotle (384-322 B.C) studied and classified various living organisms, but their classifications were not based on scientific method and reasoning. Theophrastus (370-285 B .C), a disciple of Aristotle classified the plants on the basis of form and texture and is known as the ‘father of botany’. His book ‘Historia Plantarum’ deals with 480 plants.

With the decline of the Greek and Roman civilization, there was no significant botanical advancement for more than fourteen centuries. However, there was again awakening of botanical learning in the sixteenth century when several herbals, especially those of Brunfels (1530), Bock (1539), Fuchs (1542), Turner (1551), Cordus (1561), Lobelius (1581) and Gerar (1597) were published.

Otto Brunfels was one of the first among the group of renowned herbalists, who described and illustrated the plants known to that period. They were more interested in the purported medical values and domestic uses of plants. Brunfels produced one of the first illustrated herbals and recognized the perfect and imperfect groups of plants characterized by the presence and absence of flowers respectively. The herbalists as a group are important for their contribution to the descriptive phases of systematic botany.

In the 17th century two European scientists John Ray (1627-1706) and Francis Willougby (1635-1672) collected many plants and animals and classified them. Ray described 18,000 plants and published between 1686 and 1704 a book ‘Historia Generalis Plantarum’ in three volumes.

Carl Linnaeus (1707-1778), a Swedish naturalist, who is also called ‘father of taxonomy’, classified the organisms according to his own system of classification, which is called binomial system of nomenclature. This system is based on the principle of naming organisms by two words: genus and species. According to him existing species of plants and animals were the descendants of the previously created species. His ‘Systema Naturae’ appeared in 1735.

**Developments in the Field of Medicine:**

Medical science has made enormous strides during the last 150 years.

1. Rene Laennec is world renowned for his invention of the stethoscope.

2. With the aid of the microscope, Robert Koch discovered the germs, which caused cholera and tuberculosis.

3. Emil Von Behring enabled the protection of children from diphtheria by introducing vaccination.

4. Walter Reed, an American doctor, found that mosquitoes spread yellow fever.

5. Sir James Young Simpson discovered the anesthetic properties of chloroform.

6. Sir Joseph Lister, a world-renowned English surgeon of Glasgow University, is considered to be the father of antiseptic surgery.

7. Sir Alexander Fleming demonstrated that Penicillin is a miracle drug in treating diseases like pneumonia, syphilis, peritonis, tetanus and other illnesses.

8. The first successful heart transplant was performed by Dr. Christian Barnard.

**3. Objectives of Biological Science:**

Learning objectives guide you to take the required actions to bring those changes and help you to make your learning meaningful. Learning objectives help you to find the answers for the questions like, how will you focus the attention of your students on the expected learning activities?

The type of teaching learning strategies to be planned? The ways and means by which the student constructs and re­constructs the knowledge? How can you help yourself and the learner in self-assessment? And facilitate to perform and plan out work systematically.

**Meaning of Learning Objectives- Are Learning Objectives External?**

The aims of education, which can be achieved in a school, are called as objectives. An objective is a part of an aim. It indicates an end point of possible achievement. Objectives are immediate attainable goals. They vary from subject to subject and they are specific, precise and clearly defined and become meaningful to the students and teachers in a teaching-learning situation.

Objectives make a teaching programme meaningful. They indicate the behavioral changes in the pupil after completion of instruction. It is the expected terminal behavior or a learning outcome of the pupil at the end of teaching-learning process.

**1. Good, C.V. (1959):**

Defines, objective as “an end towards which a school sponsored activity is directed”.

**2. Mohan, R. (2002):**

Defines “an objective as a point or an end view of the possible achievement in terms of what a student is able to do when the whole educational system is directed towards educational aims”.

The terms aims and objectives are usually taken as synonymous terms in education. Aims need long term planning. Objectives are a means of achieving these aims and in a definite way. The aims of teaching science can be broken down into smaller objectives, which may be helpful in providing the learning experiences and bringing desirable Changes in the individuals.

**Criteria for Selecting the Objectives:**

1. Specific- A good objective should not be vague. It should be specific and directed towards an activity.

2. Unambiguous- A good objective should not be ambiguous, it should be clear in specifying the required outcomes.

3. Appropriate- The objectives should provide appropriate learning in tune with the age and maturity of the learner.

4. Practicable- The objectives should provide practical experiences in learning.

5. Feasibility- Objectives should be practically possible to be achieved in the classroom.

**Objectives of Teaching Biology:**

1. Providing Practical knowledge of the content.

2. Providing Advanced information.

3. Developing skills, remembering, understanding, interests, and appreciation, application and analysis through the teaching of life science.

4. Stimulating the spirit of investigation and invention.

5. Improving the power of observation and experimentation.

6. Developing the problem solving capacities.

7. Understand the utility of biological science to the modem life.

8. Inculcating the ideals like truthfulness, open-mindedness and reflective thinking in the learner.

9. Inculcating the values of democracy, freedom, equality and fraternity.