INDONESIA UNIVERSITY OF EDUCATION/UPI/

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DEPARTMENT OF BIOLOGY

Characteristics of Biology Instruction and Science Teaching

For

Biology Teaching/BI707/ Course

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WHAT IS SCIENCE?

Science is both a process – a way of thinking and working to make sense of the natural world; and a product – a body of knowledge produced that process, such as explanations. Science is also an activity that involves and affects people through its application. Science education is important because it offers a way of thinking about the world that has application in everyday life of human; and well-founded explanations of the world.

Characteristics of Biology Instruction

- BIOLOGY is a part of science . Biology is taught as science in primary education and as Biology in senior high school and universty level. Biology as part of science has its nature, characteristics & value.
- **The Nature of Biology:** Biology as part of science has its nature involving Product, Process and Application (Technology).
- *As <u>product</u>* : facts/data ..... concepts.....principles ...theories... laws, etc. got in relation to living things and their environment.
- *As <u>process</u>* : biological products were found through scientific methods. The method or steps used and followed during biological study is the process of finding knowlede about the living world.
- *As <u>Application</u>*: the product of biological studies are used in biotechnology, genetic engineering, food manufacuring, industries, agriculture, etc.

Characteristics of Biology

- Biology is the quine of science at the 21st century i.e. the 21st century is the age of Biology (Naisbitt & Aburdene, 1990). This is because many principles of chemistry and physics came from biological concepts. For instance biophysics is popular in living cells i.e.

- ✓ the transport function of the cell membrane and
- ✓ abiotic factors of the environment

- Results of Study on Biology Education have great role in developing Science and Technology.

  - ➢ Study physical structure & function of human organs with full of curiosity;
  - ➢ Study environment;
  - ➢ Human body and nature as a system;
  - ➢ Terminology in Biology
  - ➢ Populations and ecosystems
  - ➢ Human health and medicine
  - ➢ Biology is unique in thinking:

e.g. cybernatic thinking in physiology, logical thinking in taxonomy, & combinatorial thinking in population genetics.

How to Educate Biology

- ➢ Methods are the means or ways that we use to teach material to our students. Our choice of methods depends on:
  - ➢ Who we are teaching,and
  - ➢ the level of competence expected
  - ➢ what we want to teach (content),
- ➢ When we educate biology, we are Preparing high quality Human Resources (Physically, ways of thinking, life pattern)
- Content can be divided into the three domains of knowledge: *Skills, Attitudes, and Values*.

- When we are teaching knowledge, we can use a variety of methods, with the goal of getting the learner to actively engage in learning the material.
- When teaching skills in biology, we need to demonstrate and point out important aspects, supervise the student doing the skill, or talk the student through the skill.
- When teaching about attitudes, we need to use methods that require the application of the attitude in particular situations.

How Biological Knowedge Aquired

- Knowledge in Biology got through hands on & minds on activities. So BIOLOGY should also develop thinking process and thinking pattern (systematic, critical, logic, etc.)
- Biology must be given for all, not only biology for biologist i.e. Every member of society & every citizen must know about biology, life and life processes.

Science Process Skill

- Science process skill:- is the way of investigation that involves specific skills which requires the following steps:
  - Planning experiment
  - Carrying out activities
  - Collecting data
  - Organizing and interprating data
  - Drawing a conclusion

In science teaching, teaching the process skills rather than the products from text book is more important for students future life. Science process skills are skills that scientists used in the process of doing science. In primary science education there are six basic science process skills. These are:

1. **Observing** = gathering information using our senses.
2. **Measuring** = taking quantitative data of length, weight, etc.
3. **Infering** = formulating explanation based on once observation.
4. **Classifying** = grouping/ordering objects or events.
5. **Predicting** = guessing the most likely outcome of future events.
6. **Communicating** = using words/symbols/graphs to describe objects.

Learning science means learning the scientific **product (knowledge)**, **process** and **attitude**. We teach science for our students if and only if we develop and teach these three aspects of science all together. If we teach students only products (knowledge, principles, concepts, theories, etc), we did not tought them science rather we tought them only part of science.

In reality most students in thier primary school learn the science products from books, teachers or other sources. However; in teaching science not only facts and theories we teach to our students but also we should indicate the way or the process skills for students the how to solve problems by themselves, how to get knowledge of thier own and how they develop scientific attitude.

In order to teach all these three aspects of scince together for our students in primary school, text books should have activities in the form of questions, projects, or laboratory works. The activities designed for active engagement of students to a certain problem and initiate them to find a solution for themselves. In addition the activities presented in the students text book should promote the development of science process skills like observation, measurment, classification, prediction and communication.

Basic and Integrated Science Process Skills

- **Basic Science Process Skills** :- Involve analysis and empherical procedures that are use in scientific practical work and include the following skills:

❖ **Observing**
❖ **Measuring**
❖ **Infering**
❖ **Classifying**
❖ **Predicting**
❖ **Communicating**

*** These basic science process skills are applied at primary school levels

- **Integrated Science Process skills:-** are complex processes that combine two or more basic science processes and include the following skills:

➢ **Formulating hypothesis**
➢ **Identifying variables**
➢ **Defining variables operationally**
➢ **Describe relationships between variables.**
➢ **Describing investigation**
➢ **Experimenting**
➢ **Aquiring data**
➢ **Organizing data**
➢ **Analyzing the investigation and data**
➢ **Understanding cause and effect relationships**
➢ **Formulating models**

*** These science process skills are applied at higher levels with the knowledge and skills of basic science process skills.