

# **PEDAGOGY OF BIOLOGICAL SCIENCE**

## **FIRST YEAR / SEMESTER I**

### **OBJECTIVES**

At the end of the course, the student teachers will be able to

- understand the basic principles and practices of Science Education relevant to teaching Biological Science in the Secondary and Higher Secondary Classes.
- acquire various micro-teaching skills
- acquire the knowledge relating to the organization and administration of a Biology laboratory.
- learn appropriate teaching techniques.
- acquire adequate skills in using proper and suitable methods of teaching Biology.
- understand the qualities of a good Biological science teacher.

### **UNIT I - GOALS AND OBJECTIVES**

**(15 hours)**

Biology in the School Curriculum – Its Claims for Inclusion - Relation between Biology and Other Subjects - Interdisciplinary approaches in Teaching Biology. Goals and Objectives of Teaching Biology with Reference to Bloom's Taxonomy. Cognitive, Affective and Psychomotor Domains. Aims of Teaching Biology at Different Levels - Primary, Secondary and Higher Secondary.

**Activity** : Choose any 5 topics in biology and write the objectives (cognitive, Affective and Psychomotor) objectives based on Bloom's Taxonomy.

### **UNIT II - MICRO-TEACHING**

**(14 hours)**

Micro-Teaching – Definition - Advantages – Micro-Teaching Cycle – Micro-Teaching Skills – Skill of Introducing a Lesson – Skill of Explaining – Skill of Probing Questions – Skill of Stimulus Variation – Skill of Reinforcement – Skill of Using Black Board – Skill of Achieving Closure – Skill of Demonstration - Link Lessons.

**Activity** : Practicing any 3 skills and Link lesson.

### **UNIT III - METHODS OF TEACHING BIOLOGY**

**(16 hours)**

Methods of Teaching Biology - Criteria for Selection of a Method – Types – Lecture Method - Lecture Cum Demonstration, Laboratory Method - Scientific Method of Teaching and Problem Solving – Project Method – Heuristic Method –

Dalton Method – Team Teaching – Seminar - Symposium – Workshop - Panel Discussion - Assignment Method - Historical and Biographical Method.

Instructional Technology and Its Application to the Teaching of Biology. Programmed Instruction, Teaching Machines, Personalized Instruction, Computer Assisted Instruction, - E-Learning, Internet, Power Point Presentation.

**Activity** : Identification of Botany / Zoology topics suitable for various methods.

#### **UNIT IV - CURRICULUM IN BIOLOGY (15 hours)**

Qualities of a Good Biology Text Book – Use of Text Books -Values of a School Biology Library – Divisions of Library - Principles of Curriculum Development - Selection of Content and Organization of Subject Matter – NCERT Curriculum - BSCS and Its Versions - Nuffield Secondary Science Project.

**Activity** : Critical analysis of IX and X std. science text books.

#### **UNIT V - SCIENCE TEACHER (15 hours)**

Academic Qualifications – Professional Training - Special Qualities Required of a Science-Teacher - In-Service Training - Class Room Climate - and its Types - Flanders Interaction Analysis.

**Activity** : Preparing self evaluation questionnaire.

#### **REFERENCES**

- ❖ Buff aloe, Neal, and Throne berry, J.B., Principles of Biology Teaching, Prentice-Hall of India Limited, 2<sup>nd</sup> Edition, New Delhi 1972.
- ❖ Chauhan, S.S., Innovations in teaching learning process, Vikas publishing House, New Delhi, 1985.
- ❖ Garrett, H.E Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd., Bombay, 1979.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Teaching of Biology, Neelkamal Publications, New Delhi, 2010.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Micro Teaching - A way to Build up Skills , Laxmi Book publication. Solapur , 2015. Jean Bremen, Teaching of Biology, Macmillan, St.Martin's Press, New York.
- ❖ John S.Richardson, Science Teaching in Secondary Schools, Prentice Hall, 1962.
- ❖ Joseph, J. Schwab, T., Teaching of Science Harvard University Press, 1964.
- ❖ Miller and Blaydes, Methods and Materials for Teaching Biological Science. McGraw Hill, 1962.
- ❖ Saunders, H.N., The Teaching of General Science in Tropical Secondary School, Oxford University Press, London, 1967.
- ❖ Sharma, R.C., Modern Science Teaching, Dhanpati Rai and Sons, 1985.
- ❖ Walter A., Thurber and Alfred T. Collette, Teaching Science in Today's Secondary Schools, Prentice Hall, 1964.

**PEDAGOGY OF BIOLOGICAL SCIENCE**  
**FIRST YEAR / SEMESTER II**

**OBJECTIVES**

At the end of the course, the student teachers will be able to

- develop the skill of writing lesson plan.
- develop scientific attitude , a sense of appreciation and interest in Biology.
- acquire the skill of constructing a test
- develop skills in using modern technology in teaching biology.
- understand the criteria in selecting and evaluating a Biological Science text book.
- realize the value of biological science library.
- develop the ability to construct a curriculum and to evaluate critically the present curriculum.

**UNIT I - LESSON AND UNIT PLANNING (15 hours)**

Lesson Planning – Definition – Need, Advantages – Principles of Lesson Planning – Their Importance- Merits And Demerits - Unit Plans – Objectives of the Tamilnadu Text Book Curriculum at Different Levels of School Education.

**Activity** : Writing 20 lesson plan

**UNIT II - BIOLOGY LABORATORY (15 hours)**

- I. Practical Work in Biology: Importance of Practical Work - Organizing the Work of the Practical Class. Laboratory Accidents – Safety and First Aid – School Biology Record-Written Notes and Drawings – Instructional Cards.
- II. Museum – Importance of Museum –Preparation of Museum Materials. Maintenance of Aquarium, Vivarium & Terrarium.
- III. Herbarium Preparation – Techniques – Importance.

**Activity** : Preserving and maintaining biological specimens.

**UNIT III - EDUCATIONAL TECHNOLOGY (15 hours)**

Projected Aids – Audio Visual Aids – Audio Video Players – Tapes and CDs, OHP and transparencies – Slide and Film Projectors, Radio and TV (Broad Cast and Telecast), CCTV, Multimedia Computers, Lap-top, Power Point. Non Projected Aids – Charts – Models – (Static and Working), Flash Cards, Pictures, Chalk, Flannel,

Magnetic, and Bulletin Boards – Exhibits, CAI, Internet, e-learning – on-line Teaching and Learning.

**Activity** : Prepare 5 slides for any 5 topics in biology

#### **UNIT IV – EVALUATION**

**(15 hours)**

Different Types of Tests in Biology – Achievement – Diagnostic – Prognostic. Criterion and Norm Referenced Evaluation – Construction and Administration of Achievement Test – Examining the Results of Tests Against Objectives – Item Analysis.

**Activity** : Constructing and conducting an achievement test and interpreting the scores

#### **UNIT V - STATISTICAL MEASURES**

**(15 hours)**

Measures of Central Tendency - Mean, Median and Mode – Measure of Variability - Range, Average Deviation, Quartile Deviation and Standard Deviation - Rank Correlation. Graphical Representation of Data – Bar Diagram - Pie Diagram - Histogram, Frequency Polygon, Frequency Curve, Ogive.

**Activity** : Preparation of Transparencies sheets to represent data(graphical)

#### **REFERENCES**

- ❖ Biology A Text Book for Higher Secondary Schools (Section 1-7).
- ❖ Buffaloe, Neal, and Throneberry, J.B., Principles of Biology Teaching, Prentice - Hall of India Limited, 2<sup>nd</sup> Edition, and New Delhi 1972.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Teaching of Biology, Neelkamal Publications, New Delhi, 2010.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Micro Teaching - A way to Build up Skills , Laxmi Book publication. Solapur , 2015. Jean Bremen, Teaching of Biology, Macmillan, St.Martin’s Press, New York.
- ❖ Garrett, H.E Statistics in Psychology and Education, Vakils, Feffer and Simons Ltd., Bombay, 1979.
- ❖ Green, T.L., The Teaching of Biology in Tropical Secondary Schools, Oxford University Press, 1965.
- ❖ Jean Bremen, Teaching of Biology, Macmillan, St.Martin’s Press, New York.
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- ❖ Nair, C.P.S., Teaching Science in our Schools, S. Chand and Co. (Pvt) Limited 1971.
- ❖ Sharma, R.C., Modern Science Teaching, Dhanpati Rai and Sons, 1985.

**PEDAGOGY OF BIOLOGICAL SCIENCE**  
**SECOND YEAR / SEMESTER III**

**OBJECTIVES**

At the end of the course, the student teachers will be able to

- acquire the knowledge about history of biology.
- be aware of significant discoveries of great biologist.
- acquaint themselves with new developments in biology.
- analyse the classroom climate and adopt suitable teaching Methods.
- understand the need for reflective practices.
- select suitable model of teaching in the Biology classes.

**UNIT I - INTRODUCTION TO BIOLOGY**

**(15 hours)**

Historical Development of Biology – Nature and Scope of Biology – The Great Biologists – Contributions of Great Biologists : Charles Darwin, Louis Pasteur, Robert koth, Luc Montagnier and Gallo, Dr. Ian Wilmut. Significant Discoveries and Inventions in the field of Biology.

**Activity** : Prepare a chart showing the contribution of any five Biologists to the field of Biology.

**UNIT II - NEW DEVELOPMENTS IN BIOLOGY**

**(1 hours)**

Microbiology - Biotechnology – Biochemistry- Biophysics - Developmental Biology - Population Genetics and Evolution - Genetic Engineering - Ecology and Conservation - The New Medicine and The Teaching of Biology - Radio Isotopes in Biology teaching.

**Activity** : Collect information regarding the recent trends in the field of Biology and its application and prepare a report.

**UNIT III - CLASS ROOM INTERACTION ANALYSIS**

Nature – Objectives – Assumptions – Flanders Interaction Analysis – Concepts and Principles of Teacher Influence. Teaching Behaviour and Learning Goals – Implications and Limitations – Reciprocal Category System – Equivalent Talk Category System.

**Activity** : Prepare a report on the behavioural changes needed for a biology teacher in order to attain the set objectives.

## **UNIT IV - REFLECTIVE PRACTICES**

Definition - Nature - Meaning and Need for Reflection. Evaluation Techniques to Measure Reflection - Importance of Reflective Practices.

**Activity** : Prepare an evaluation sheet for measuring reflection and produce the report for the same.

## **UNIT V - MODELS OF TEACHING BIOLOGICAL SCIENCE**

Introduction – Definition – Characteristics – Functions – Sources – Elements of a Model - Types – Concept Attainment Model – Advanced Organizing Model – Inquiry Training Model.

**Activity** : Create a comparative chart showing the various models of teaching biological science with appropriate pictures.

## **REFERENCES**

- ❖ Brubacher W John, case W Charles, Reagen G Timothy, Becoming a Reflective Educator, Corwin Press, Inc California, 1994.
- ❖ Chauhan S.S. Invocations in Teaching Learning Process, Vikas Publishing House Pvt. Ltd., 1979.
- ❖ Cyril Selmes, New Movements in the study and Teaching of Biology, Temple Smith London, 1978.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Teaching of Biology, Neelkamal Publications, New Delhi, 2010.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Micro Teaching - A way to Build up Skills , Laxmi Book publication. Solapur , 2015. Jean Bremen, Teaching of Biology, Macmillan, St.Martin's Press, New York.

# **PEDAGOGY OF BIOLOGICAL SCIENCE**

## **SECOND YEAR / SEMESTER IV**

### **OBJECTIVES**

At the end of the course, the student teachers will be able to

- identify gifted and backward students.
- be aware of various enrichment programme.
- choose and use appropriate teaching aids for a particular class.
- encourage the students to Utilize the community resources.
- write Science Project reports.
- understand the various extension educational programmes available.

### **UNIT I - ENRICHMENT AND REMEDIAL SCIENCE PROGRAMMES**

Grouping – Ability Grouping – Gifted Children – Meaning – Definition – Identification – Educating the Gifted – Enrichment Programme – Acceleration – Special Grouping; Types of Enrichment Programme – Lateral –Intensive Programme – Science Talent Search Programme; Slow Learners – Identification - (Remedial Programme for Slow Learners) - Role of Teachers in Educating the Slow Learners – Special Curriculum – Special Teaching Methods.

**Activity** : Prepare album showing the various the methods of teaching creative children.

### **UNIT II - INSTRUCTIONAL RESOURCE CENTRE**

Planning of Class Room Accessories – Preparation of Teaching Aids – Significance – Characteristics – Values – Advantages –Preparation of Improvised Apparatus –Photographic Dark Room.

**Activity** :Prepare any two teaching aid (working model)

### **UNIT III - STRENGTHENING SCIENCE EDUCATION**

Community Resources – Garden – Excursions – Science Clubs – Science Fair - Field Trips – Exhibitions -Nature Calendar – Objectives – Importance – Advantages –Organization - Principles and Functions.

**Activity** : Prepare a chart showing the various activities to organizes science expo.

## **UNIT IV - REAL SCIENCE PROJECTS**

Aqua Culture Project – Seed Project – Product Test and Rating Project-  
Selection of Science Projects – Writing Science Project Reports.

**Activity** : Prepare a list of various projects for science subject.

## **UNIT V - EXTENSION EDUCATION**

Extension Education – Definition – objectives – Need – Significance –  
Planning and Organizing – Types of Extension Education Programme – Implications  
– Role of Technology in Extension Education.

**Activity** : Collect information regarding the roll of technology in advancing science education.

## **SUGGESTED PRACTICAL WORK**

- Power Point Presentation.
- Web-Site Comparision.
- Field Trip
- Photo Album, Nature Album.
- Preparation of Herbarium.
- Collection of Feathers, Shells etc.

## **REFERENCES**

- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Teaching of Biology, Neelkamal Publications, New Delhi, 2010.
- ❖ Hemalatha Kalaimathi, D., and Asir Julius, R. Micro Teaching - A way to Build up Skills , Laxmi Book publication. Solapur , 2015. Jean Bremen, Teaching of Biology, Macmillan, St.Martin's Press, New York.
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- ❖ Das R.C Science Teaching in Schools, Sterling Publishers Pvt. Ltd., 1992.
- ❖ Elizaba Zachariah, The Teaching of Biological Science in Schools, 1965.
- ❖ Neal.Glasgow, Doing Science, Corwin press, Inc, A Stage Publications Company,California, 1996.