

## PEDAGOGY OF SCIENCE

Maximum Marks : 100

External: 70

Internal: 30

### Design of the Course

- Each unit of study to have a field-based assignment.
- Specific readings are to be used for discussion in groups enabling a close reading of texts.

### Rationale and Aim

The aim of this course is to encourage students to engage with the nature of science and relate it with inquiry in this area. This will involve challenging students' misconceptions related to concepts in science and help them advance towards a better understanding. They will need a space to freely express their ideas about various aspects of the nature of science and reflect on classroom practices based on this understanding. The students should be able to critically reflect on issues of gender and inclusive space in science education.

This course builds on the Pedagogy of EVS paper and helps student-teachers to reflect on the nature of the discipline of science and its implications for classroom transaction.

### Specific objectives

- To encourage students to revisit their own conceptual understanding of science
- To engage students with various aspects of the nature of science.
- To help students understand children's ideas in relation to cognitive development and children's understanding of scientific concepts.
- To help students select and use appropriate teaching-learning and assessment strategies.
- To enable students to view science as an inclusive and a democratic enterprise.

### UNITS OF STUDY

#### UNIT 1: Understanding what is Science and Children's Ideas in Science

- Subject matter in Sciences and Social Sciences
  - i. Scope
  - ii. Branches
  - iii. Educational Values
  - iv. Importance of Science education for developing society.
  - v. Problems and Remedies
- Why do we teach Science?
- Science and other subjects( their relationship, interdependence and correlation)

- Science as information or enquiry (Critical understanding)
- Qualities of a good Science teacher
- Development of scientific attitude.

#### **UNIT 2: Revisiting School Science Concepts**

- The World of the Living: Diversity: basic unit of life: life processes: reproduction; heredity and evolution
- Matter: Its nature; basic units of matter: their structure
- Natural Phenomena: Force and motion; gravitation; magnetism; electricity
- Natural Resources: Air, water, soil and their conservation; sources of energy

#### **UNIT 3: Class-room transaction and Assessment**

- Different ways of conducting inquiry: setting up simple experiments and investigations in different contexts
- How to wrap up an inquiry-based learning session
- Science museums, field trips, projects and exhibition.
- Developing different assessment strategies including appropriate questions for paper pencil tests.
- Preparing Unit plans based on concept maps.
- Assessing teaching-learning materials such as books, films, multimedia packages for their relevance and age appropriateness

#### **UNIT 4: Science for All**

- Issues of gender, language, culture and equity in science classes
- Critical study of Science curriculum in Elementary Schools in Mizoram.
- Introduction to science and society interface

*Issues such as availability of water, indigenous people and their knowledge base, loss of habitat and endangered species, energy conservation and climate change (especially locally relevant) can be taken up for literature survey, discussions, campaigning through posters, public hearing, talks by concerned people like farmers and also experts in the field*

#### **Mode of Transaction**

- Discussion
- Activities and experiments, recording of observation
- Survey
- Close reading of prescribed Science textbooks for Classes VI, VII & VIII

## Essential Readings

### Unit 1

1. Bloom, J. W. (2006) *Creating a Classroom Community of Young Scientists* Routledge: New York.
2. Driver, Rosalind, et. al. (1994) *Making Sense of Secondary Science: Research into Children's Ideas*. Routledge Falmer: New York.

### Unit 2

1. Bloom, J. W. (2006) *Creating a Classroom Community of Young Scientists* Routledge: New York.

### Unit 3

1. Harlen, W. (2006) *Teaching, Learning and Assessing Science 5 - 12*. Sage: UK.
2. Harlen, W. and J. Elstgeest (1992). *UNESCO Source Book for Science in the Primary School*, NBT: New Delhi.
3. Martin, D. J. (2009) *Elementary Science Methods- A Constructivist Approach*. Thomson Wadsworth: Belmont CA. 5th Edition.

## Readings for Discussion

### Unit 1

1. Driver, Rosalind. (1996) *Young People's Images of Science*, Milton Keynes- Open University Press: London.
2. Rampal, Anita (1992) Images of Science and Scientists a study of School Teachers' Views. I. Characteristics of Scientists. *Science Education*. 76(4), 415-436.

### Unit 3

1. Griffin, J. (2004) Research on students and Museums: Looking More Closely at the students in School Groups. *Science Education*, 88(suppl. 1). S59-S70.
2. Wellington, J. J. and Osborne, J. (2001) *Language and Literacy in Science Education*. Open University Press: California. Chapter 6: Discussion in School Science: Learning Through Talking, Chapter 5: Writing for Learning Science.
3. NCERT. (2006) *Position Paper on Science Education*, NCERT: New Delhi.

### Unit 4

1. Brickhouse, N. (2001) Embodying Science: A Feminist Perspective. *Journal of Research in Science Teaching*, 38(3), 282-295.
2. Kurth, A., et. al. (2002) The Case of Calra: Dilemmas of helping all students to understand Science, *Science Education*. 86, 287-313.
3. Shiva, V. (2002) *Water Wars* South end press.: Cambridge, USA

## Advanced Readings

### Unit 1

1. Kang, S et al (2004) Examining Students' Views on Nature of Science: Results from Korean 6th, 8th and 10th Grades. *Science Education*, 89(2), 314- 334.
2. McComas, William F. (ed.) (1998) *The Nature of Science in Science Education: Rationales and Strategies*, Kluwer Academic Publishers: Netherland
3. Okasha, S. (2002) *Philosophy of Science- A very short Introduction* Oxford University Press: UK.
4. Schwartz, S. Renee et. al. (2004) Developing Views of Nature of Science in Authentic context: An explicit approach of Bridging the Gap between Nature of Science and Scientific Inquiry. *Science Education*, 88(4), 610 - 645.

### Unit 3

1. Liewellyn, D. (2005) *Teaching High School Science through Inquiry - A Case Study Approach*. Corwin Press and NSTA Press: California
2. Osborne Jonathan F. (1996) Beyond Constructivism. *Science Education*, 80(1), 53-82

### Unit 4

1. Aikenhead, G. (2001) Integrating Western and Aboriginal Sciences: Cross Cultural Science Teaching. *Research in Science Education*, 31(3), 337-355
2. Choksi, B. & Natarajan, C. (2007) *The epiSTEME Reviews- Research Trends in Science, Technology and Mathematics Education*. Macmillan : New Delhi
3. Rampal, A. (1993). School science in search of a democratic order? In Kumar, K. (Ed) *Democracy and Education in India*. NMML: New Delhi.

## Textbooks and Reports

1. Bal Vigyanik, *Text books for Science, Class VI - VIII*. Madhya Pradesh: Eklavya
2. Centre for Science and Environment, *Citizen's reports*, New Delhi.
3. NCERT, (2005). *Syllabus for Classes at the Elementary Level*, vol. I, NCERT: New Delhi.
4. NCERT, (2008). *Text books for Science, Class VI - VIII*. NCERT: New Delhi.