

B.Ed. Two Year Programme

P.1.2 : Science

Maximum Marks: 100

Course Objective

This course would enable the pupil teachers to understand Science as a discipline through its philosophical and epistemological perspectives. The insights into the nature of science and how children construct knowledge science would help in developing a critical understanding about the curriculum in science and how it unfolds through the transactional processes at the various levels of school education. Thus, this course aims to lead the pupil teachers from an understanding about science discipline to a holistic understanding about science-education situated in learner context and social realities.

Unit I : Nature of Science and Science Education

- The nature of science- science as a process and science as a body of knowledge, as a social enterprise; Science-Technology-Society-Environment (STSE) Interface.
- A historical perspective: the development of science as a discipline; awareness of the contributions of Popper and Kuhn.
- A critical understanding of science as a subject at the various levels of school education and thereby of the purpose of science education at the various levels of school education.
- Development of Scientific Temper, public understanding of science, ethics of science; science education in the context of a developing country.

Unit II: The learner Context

- Children's conceptualisation of scientific phenomena- Pre-conceptions in science and their significance in knowledge constructions (with linkages to learning at the primary level); Misconceptions and 'alternative frameworks' in science.
- Understanding children's fear of science addressing their inabilities to correlate the observed phenomena with micro level processes and with their symbolic/mathematical representations.
- Construction of knowledge in science: conceptual schemes, concept maps.
- Role and limitation of language: its contribution towards expression, articulation and the understanding of science.
- Addressing Learner-diversity: gender issues, special need-learners, contextual factors.

Practicum (Unit I-II): Project/assignment based on school ~~experience~~ observations.

Unit III: The science curriculum

- The nature and underlying criteria for a science curriculum and content organization.
- Approaches to curriculum transaction: integrated approach and disciplinary approach; Interdisciplinarity.

- A critical review of Science Curriculum at the National Level i.e. NCERT curriculum, at the State Level i.e. SCERT curriculum, Hoshangabad Science Teaching Programme (HSTP) ; An awareness about science curricula at international level such as Nuffield Science, Harvard Science, project 2061 etc .
- Criteria for the analysis of science textbooks (including issues related to gender, the socio-cultural context, etc.)

Practicum: Critical analysis of existing science syllabi and textbooks.

Unit IV : Enrichment of Content Knowledge

- Devising content analysis and enrichment programme for selective content areas in physics, chemistry and biology (working through group/workshop/seminar modes).
- Developing representations/creative expressions of the outcomes of content enrichment.
- Taking comprehensive feedback from peers regarding the processes and outcomes of content enrichment.

Unit V: Professional Development of Science Teacher

- Need for professional development
- Professional development at the individual, organisational and governmental level.
- Teacher as a researcher: Action research by teachers in collaboration with research institutions, voluntary organizations, etc.

Practicum : Conducting Action Research in any area related to science education.

Suggested Reading List

Aikenhead, W. W. (1998). Cultural aspects of learning science. *Part one* , pp 39-52. (B. F. Tobin, Ed.) Netherlands: Kluwer academic Publisher.

Barba, H.R. (1997). *Science in Multi-Cultural Classroom: A guide to Teaching and Learning*. USA: Allyn and Bacon.

Bevilacqua F, Giannetto E, & Mathews M.R., (eds.). *Science Education and Culture: The Contribution of History and Philosophy of Science*. The Netherlands: Kluwer Academic Publishers.

Coburn, W. W. (1998). *Socio-Cultural Perspectives on Science Education*. London: kluwer Academic Publisher.

Deo, M.G. & Pawar, P.V. (2011), General Article: Nurturing Science Talent in Villages, In *Current Science*, Vol. 101, No. 12, pp1538-1543.

Hines, S. M. (Ed.). (2005). *Multicultural science Education: Theory, Practice, and Promise* (Vol. 120). New York, U.S.A: Peter Lang.

Lee, E. & Luft, J. (2008), Experienced Secondary Science Teachers' Representation of Pedagogical Content Knowledge. *International Journal of Science Education* 30(10), 1343-1363(21), August

- Lee, O. (2003). Equity for Linguistically and Culturally Diverse Students in Science Education. *Teachers College Record*, 105 (3), pp 465-489.
- Lynch, S. J. (2000). *Equity and Science Education Reform*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- National Curriculum Framework for Teacher Education: Towards Preparing Professional and Humane Teacher (2009-10)*, NCERT: New Delhi
- National Curriculum Framework*, (2005), NCERT: New Delhi
- Newsome, J. G. & Lederman, N. G. (Eds.) (1999), *Examining Pedagogical Content Knowledge: The Construct and its Implications for Science Education*. Kluwer Academic Publishers, The Netherlands
- Parkinson, J. (2002). Chapter-1. Learning to Become an Effective Science Teacher. In *Reflective Teaching of Science 11-18: Continuum Studies in Reflective Practice and Theory*. New York: Continuum. pp. 1-12.
- Quigley, C. (2009). Globalization and Science Education: The Implications for Indigenous knowledge systems. *International Educational Studies*, 2 (1), pp 76-88.
- Rashtriya Madhyamik Shiksha Abhiyan (2005)*, MHRD: New Delhi
- Rivet, A.E. & Krajick, J.S. (2008), Contextualizing Instruction: Leveraging Students' Prior Knowledge and Experiences to Foster Understanding of Middle School Science, In *Journal of Research in Science Teaching*, Vol. 45, No. 1, pp 79-100.
- Sears, J. and Sorensen, P. (Eds.). (2000) *Issues in Science Teaching*. Routledge Falmer, The Netherlands.
- Tobin, K. (Ed.). (1993). *The Practice of Constructivism Science Education*. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.
- Van Driel, J.H.V., Beijaard, D. & Verloop, N. (2001), Professional Development and Reform in Science Education: The Role of Teachers' Practical Knowledge. *Journal of Research in Science Teaching*, 38(2), 137-158, February
- Wallace J. and Loudon W. (eds.). *Dilemmas of Science Teaching: Perspectives on Problems of Practice*. London: Routledge Falmer. pp. 191-204.
- Wang, H. A and Schmidt, W. H. (2001). - History, Philosophy and Sociology of Science in Science Education: Results from the Third International Mathematics and Science Study. In F. Bevilacqua, E. Giannetto, and M.R. Mathews, (eds.). *Science Education and Culture: The Contribution of History and Philosophy of Science*. The Netherlands: Kluwer Academic Publishers. pp.83-102.