Bachelor of Education (B.Ed.)

Title of the Course: P.1.2B: Science
(Semester: II)

Credits: 2
MM: 50 (External: 35 Internal: 15)
Contact Week 15

Introduction of the Course

This course would enable the pupil teachers to develop an understanding of science curriculum and draw out a comparative analysis of various curricula and boards. Understanding learner's conceptualization of scientific phenomena and related issues will equip them with effective ways to use learner centric methodologies. Students will be made aware of various professional growth opportunities and avenues and this will help them to grow professionally and to become a good researcher as well as a reflective practitioner.

Learning Outcomes:

After completion of the course, student will be able to

1. Develop understanding of the nature of science curriculum and approaches to curriculum transaction.
2. Critically review science curricula at various levels and across various boards
3. Demonstrate an in depth understanding of learner's conceptualization of scientific phenomena for an effective learning environment.
4. Develop the ability to conceptualize construction of knowledge in science
5. Appreciate the role of teacher as a researcher and a reflective practitioner and grow professionally

Number of Units (3) **Weeks 15 = 30 hours**

Unit I: The science curriculum **(8 weeks = 16 hours)**

- The nature and underlying criteria for a science curriculum and content organization.
- Approaches to curriculum transaction: integrated approach and disciplinary approach.
- A critical review of Science Curriculum at the National Level i.e. NCERT, at the State Level i.e. SCERT etc.
- Science in the national, state, and international boards for schools

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• Criteria for the analysis of science textbooks (including issues related to gender, the socio-cultural context, etc.)

Unit II: The learner Context **(4 weeks = 8 hours)**

• Learner's conceptualization of scientific phenomena- Pre-conceptions in science and their significance in knowledge constructions (with linkages to learning at the primary level): Alternative Conceptions and Frameworks in science.

• Construction of knowledge in science: Conceptual schemes, Concept maps

Unit III: Professional Development of Science Teacher (3 weeks = 6 hours)

• Need for professional development at pre-service and in-service level

• Professional development at the individual, organizational and governmental level.

• Teacher as a researcher: Action research by teachers, role of research institutions (like INSA, IACS, HBCSE, etc.) voluntary organizations, community etc. in science education

Practicum/ Suggested Projects / Assignments (Any Two)

1. Critical analysis of existing science syllabi and textbook
2. Project/assignment based on school experience observations.
3. Conducting Action Research in any area related to science education.

Note: On the basis of the above, the teacher may design his/her own relevant projects/ assignments.

Essential/ Recommended Readings

- Aikenhead, W. W. (1998). Cultural aspects of learning science. Part one, pp 39-52. (B. F. Tobin, Ed.) Netherlands: Kluwer academic Publisher.
- Chander, S. (2018). Developments in Information and Communication Technology for Inclusive Education: Issues of Access and Pedagogy. In V. Saxena & S. Kumar (Eds.). Psychological and Sociological Perspectives in Diversity and Inclusion: An Anthology for Researchers and Practitioners. Kanishka Publication.
- Chaudhari, P. (2022). *Teaching-Learning Resources for Science Teachers*. New Delhi: ABI.

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- Chhabra, M., & Das, R. (2023). Students' understanding of electrostatic force as a vector quantity at the undergraduate level. Physics Education, 58(3), 035016.
- Cobern, 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.
- Gega, C.P. & Peters, M.J. (1998). Concepts and experiences in elementary school (3rd ed.) USA: Pearson education.
- 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
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- National Curriculum Framework for School Education, (2023), NCERT: New Delhi
- National Curriculum Framework, (2005), NCERT: New Delhi
- National Education Policy, (2020).
- NCERT (2013). *Pedagogy of Science. Physical Science Part I: Textbook for B.Ed.* New Delhi: NCERT.
- NCERT (2013). *Pedagogy of Science. Physical Science Part II: Textbook for B.Ed.* New Delhi: NCERT.
- NCERT (2019). Vigyan Shiksha shastra (Bhautik Vigyan Bhag I). New Delhi: NCERT.
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- 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.

- Pedagogy of Science: Physical Science – (Part I & II) (2013). National Council of Educational Research and Training.
- 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.
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- 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.
- Wellington, J. (2018). Secondary Science: Contemporary Issues and Practical approaches. USA: Rouledge
- Wellington, J., & Ireson, G. (2012). Science learning, Science Teaching (3rd ed.). London and New York: Routledge

Teaching Learning Resources (Digital):

- Amrita Vishwa Vidyapeetham. (n.d.). Virtual Labs. http://www.amrita.edu/virtual-labs
- e-Yantra. (n.d.). Robotics and Embedded Systems. http://www.e-yantra.org
- Gupta, A. (n.d.). Arvind Gupta Toys. http://www.arvindguptatoys.com/
- Indian Academy of Sciences. (n.d.). Journals. https://www.ias.ac.in/Journals

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- National Council of Educational Research and Training. (n.d.). Diksha. https://diksha.gov.in/
- National Council of Educational Research and Training. (n.d.). National Repository of Open Educational Resources (NROER). https://nroer.gov.in/
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- NPTEL. (n.d.). https://nptel.ac.in/
- OpenStax. (n.d.). https://openstax.org/
- University of Colorado Boulder. (n.d.). PhET Interactive Simulations. https://phet.colorado.edu/
- Vigyan Prasar. (n.d.). http://www.vigyanprasar.gov.in/
- e-PG Pathshala. (n.d.). https://epgp.inflibnet.ac.in/

Teaching Learning Process:

The course will be taught through interactive pedagogic methods such as classroom discussions, debates, collaborative learning tasks, laboratory methods with the appropriate use of digital processes, so as to enhance reflective practices and critical analytical thought processes among learners. Self-learning, self-exploration, creative expression and comprehension & application of concepts will be encouraged.

Assessment Method:

The assessment will be formative in nature both in theory and practicum and will focus on rigorous student participation. Individual and group tasks will aim at developing scientific temper among learners. Assessment will also be based on development of creative expressions, critical understanding, reflections and ethics in science.

Keywords: Curriculum, Knowledge, Frameworks.

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