Master of Education (M.Ed.)

Title of the Course: S.Sc. 3(e): Science Education: Policy and Practice

Semester: I, II, III, & IV)

Credits: 4

MM: 100 (External: 70 Internal: 30)

Contact Week: 15

Introduction of the Course

This course aims to develop an understanding of perspectives in science education through a study of policy and practice. It looks at trends in science education policy in the last couple of decades and reviews how those have influenced school practices. It fosters deliberation on significant contemporary debates on reconceptualising science education. The course provides an in-depth understanding of pedagogical issues related to students' processes of knowledge construction. The course focuses on locating and addressing gaps in the policy-practice-research interface.

Learning Outcomes

After completion of the course, students will be able to:

1. Develop an understanding of the influence of policy on envisioned aims and practices of science education.
2. Analyze the salient features of indigenous knowledge and traditional ecological knowledge (TEK) in the context of science education.
3. Evaluate Policy-Practice interface in the context of curriculum, role of language and processes of assessment.
4. Reflecting on the gaps in the policy-practice-research interface and ways of addressing them.

Number of Units (3) **Weeks 15 = 60 hours**

Unit 1: The Policy Perspective **(5 weeks = 20 hours)**

- The influence of policy on envisioned aims and practices of science education, on the curriculum, including syllabi, pedagogy, classroom and assessment practices, resources etc.).
- Reconceptualising science education in the context of 'science for all'; the role of indigenous knowledge, traditional ecological knowledge (TEK).

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Unit 2: The Policy-Practice interface **(5 weeks = 20 hours)**

- Curriculum and practice; Formal and in/non formal learning in science; learners' conceptual development and alternative frameworks; young people's images of science and scientists;
- The role of language; exploring nature of science through holistic perspective, critical analyses of processes of assessment in school, and at national and international levels.

Unit 3: Research in Science Education **(5 Weeks = 20 hours)**

- The policy-practice-research interface: understanding the gaps; role of stakeholders in science education research; how perspectives shape research in science education.
- Addressing the gaps in the policy-practice-research interface.

Practicum/Suggested Projects/Assignments (Any Two):

1. Policy Analysis and Proposal: Select a concurrent science education policy document from national level policy documents and analyze its implications for classroom practice. Based on this analysis, propose modifications or additions to the policy to better align with current educational needs and research.
2. Curriculum Development Project: Work in groups to develop a science curriculum unit or lesson plan that integrates indigenous knowledge or traditional ecological knowledge (TEK) involving research, design, and justification for the inclusion of such knowledge in science education.

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

Essential/ Recommended Readings

- Aikenhead, G.S. (2006) *Science Education for Everyday Life*. Teachers College Press, N.Y. p 123, 107-127.
- Behrendt Helga & Dahneke Helmut. (Eds)(2001).*Research in Science Education-Past ,Present and Future*, Kluwere Academic Publishers
- Bruguiere, Catherine, Tiberghien, Andree and Clement, Pierre. (2013). *Topics and Trends in Current Science Education.* Springer.
- Cobern,W.W. (1998). *Socio-Cultural Perspectives on Science Education.* Kluwer Academic Publishers.
- Driver, R. (1983). *The Pupil as Scientist?* Milton Kenyes: The Open

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University Press. Chapters V, VI, VII, VIII.

- Driver, R., Squires, A., Rushworth, P. and Wood- Robinson, V. (1994). *Making Sense of Secondary Science*. London: Routledge. Chapters I, II, V, VI, VIII, X, XI, XII, XVII, XVIII, XX, XXI XXIII, XXIV.
- Eijck, M. C. and Roth, W.M. (2007) Keeping the Local Local: Recalibrating the Traditional in Science and Traditional Ecological Knowledge (TEK) Education. *Science Education 91: 926 – 947.*
- Elstgeest, J. and Harlen, W., *UNESCO Sourcebook for Science in the Primary School.* National Book Trust, New Delhi. Chapters VI, VII, XI.
- Fraser, B. & Tobin, Kenneth. (2003).*International Handbook of Science Education.* Springer.
- Khine, Myrint Swe. (2015).*Science Education in East Asia: Pedagogical Innovations and Research-informed Practices*. Springer.
- Koba, Susan, Wojnowski, Brenda& Yager, Robert Eugene.(2013).*Exemplary Science: Best Practices in Professional Developmen.* NSTA Press.
- Kumar, R. (2012). Basic Tenets of Constructivism: An Analysis of These Being a Referent for Teaching, Learning and Assessment in Science Basic. *Indian Journal of Education Research Experimentation and Innovation (ISSN 2231-0495)*, *2*(1).
- Kumar, R. (2013). Differentiating 'Scientific Concepts'' from "OTHER'' Concepts: An Analytico-Deductive Approach."' *Indian Journal of Education Research Experimentation and Innovation (ISSN-22310495)*, *3*(5). https://doi.org/10.1080/0950069900120507
- Kumar, R. (2013). Constructing a Theoretical Framework on Alternative Frameworks Amongst Learners in Science. *Indian Journal of Education Research Experimentation and Innovation (ISSN 2231-0495)*, *3*(4).
- Kumar, R. (2013). The 'OTHER' Concept in Learning Science: Its Formation and Related Challenges. *Indian Journal of Education Research Experimentation and Innovation (ISSN 2231-0495)*, *3*(6).
- Kumar, R. (2013). Nature of Science Framework: Describing its Need, Features and Related Classroom Practices from Research Perspective. *Indian Journal of Education Research Experimentation And Innovation (ISSN 2231-0495)*, *3*(1).
- Lederman, Norman G. & Abell, Sandra K.(Eds) (2014). *Handbook of Research on Science Education, Volume II.* Routledge.
- Millar, R. (Ed.) (1989). *Doing Science: Images of science in science education.* Lewes:

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Falmer Press. Chapters II, V.

- Mehrotra, A., Khirwadkar, A., Koul, A., Jha, A. K., Sharma, K., Mohapatra, M., … Bhatia, V. B. (2013). *Textbook of Pedagogy of Science (Physical Science) (Part II) ISBN 978-93-5007-225-7*. Delhi: National Council of Educational Research and Training.
- Mehrotra, A., Khirwadkar, A., Koul, A., Jha, A. K., Sharma, K., Mohapatra, M., … Bhatia, V. B. (2013). *Textbook of Pedagogy of Science (Physical Science) (Part I) ISBN 978-93-5007-224-0*. New Delhi, India: National Council of Educational Research and Training.
- Singh, G., & Kumar, R. (2017). Science: Perspective and Nature. In *Pedagogy of Science* (pp. 7–30). Indira Gandhi National Open University School of Education. Retrieved from http://ignoubbsr.org/BES-141

Additional References

- NCERT (2008) *Sourcebook on Assessment of Children's Learning in Environmental Studies.* New Delhi: National Council for Education Research and Training.
- Rhoton, Jack & Shane, Patricia. (2006).*Teaching Science in the 21st Century.*NSTA Press.
- Steele, A. (2014) The Seventh Current: A Case for the Environment in STSE Education. *Canadian Journal of Science, Mathematics and Technology Education, 14:3, 238-251.*
- Tan, Daniel Chwee Kim & Mijung, Kim.(Eds) (2012). *Issues and Challenges in Science Education Research: Moving Forward.*Springer.
- Tytler, Russel. (2007). *Re-imagining Science Education.* Australian Council *for* Educational Research, Victoria

Teaching Learning Resources (Digital and others):

- https://www.inflibnet.ac.in/
- https://www.education.gov.in/documents_reports
- https://ndl.iitkgp.ac.in/
- https://iksindia.org/institutions.php
- https://repository.education.gov.in/
- http://www.iitk.ac.in/new/siksa-study-centre-for-indian-knowledge-system

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- Digital Resources: Online national and international databases, journals, and repositories for accessing policy documents, research articles, and educational materials related to science education like ERIC (Education Resources Information Center), ScienceDirect, JSTOR, Google Scholar, PubMed. Education Week Research Center, National Science Digital Library (NSDL), ResearchGate, INFLIBNET, National Digital Library of India, SIKSA Study Centre etc.
- Other Resources: Textbooks, case studies, documentaries, and guest lectures from experts in the field as per the context of the discussions held in the classroom.

Teaching-Learning Process:

The teaching-learning process for this course could be designed to be interactive and participatory, incorporating a mix of lectures, discussions, group activities, and field visits. Emphasis would be placed on critical thinking, reflection, and application of concepts to real-world contexts related to the policy-practice-research interface.

Assessment Method:

Assessment would include a number of written assignments, presentations etc. Students would be assessed on their evolution in multiple dimensions related to policy issues, ability to critically analyze educational practices, understanding the needs and challenges of the contemporary world and approach towards proposing innovative solutions. Assessment would also include inputs from participation in class discussions and group.

Key Words: Science education policy, indigenous knowledge, traditional ecological knowledge (TEK), curriculum development, policy-practice interface, assessment practices, research in science education, stakeholders, critical analysis.

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