

**EDU 09.12 PEDAGOGIC PRACTICES IN PHYSICAL SCIENCE
(Handbook)**

Contact Hours: 100 (Instruction)

Maximum Marks: 100 (External: 80, Internal: 20)

UNITS	OBJECTIVES	CONTENT	SCOPE	REFERENCES
UNIT I Aims and Objectives of Teaching Science (4+7+4=15 Hours)	<p>1.1 To understand the aims and objectives of teaching science</p> <p>1.2 To appreciate the various educational taxonomies</p> <p>1.3 To realize the importance of process skills and their acquisition in learning science</p>	<p>1.1 Aims and Objectives of teaching Physical Science, objective based instruction and evaluation, objectives and specific objectives, learning experience and evaluation,</p> <p>1.2 Taxonomy of educational objectives- cognitive affective and psychomotor domains, Revised Bloom's Taxonomy, Taxonomy of Mc Cormack & Yager,</p> <p>1.3 Process skills in Science at secondary stage, Developing process skills in students.</p>	<p>1.1 The general aims of teaching science in schools; how they differ from objectives; Furst Paradigm showing the interconnection between objectives, learning experience and evaluation; what are the general and specific objectives may be discussed.</p> <p>1.2 The Blooms taxonomy should be discussed to introduce the taxonomy of educational objectives; Revised Bloom's Taxonomy should be discussed in detail; domains of science education as given by Mc Cormack and Yager , and the Digital Taxonomy .</p> <p>1.3 The process skills may be discussed along with the ways of developing process skills in children. Refer chapter 6- UNESCO Sourcebook</p>	<p>1.1 Any appropriate textbook</p> <p>1.2 Mohan, R (2007). <i>Innovative science teaching for physical science</i>. New Delhi: Prentice Hall</p> <p>Anderson, W.L & Krathwohl D.R. <i>A taxonomy for Learning, Teaching and Assessing</i>. Newyork: Longman.</p> <p>McCormack, A.J. & Yager, R.E. (1989) <i>A New Taxonomy of Science Education</i>. Science Teacher, v56 n2 p47-48</p> <p>1.3 SCERT, Kerala (2009). <i>Teachers' Hand Book, Standard VIII</i>, Education Department, Government of Kerala. Harlen, W & Elstgeest (1992) <i>UNESCO Source Book for Science in the Primary School</i> New Delhi: National Book Trust</p>
UNIT. II Teaching Skills (20 Hours)	2.1 To develop skills for effective teaching (by micro teaching)	2.1 Teaching skills for class room instruction, Essential skills for Science teaching, Micro teaching: Practicing Teaching skills- (minimum five skills); link practice	2.1 Microteaching- origin, definition, microteaching cycle, rationale and use of microteaching, phases of micro teaching. Core teaching skills- components, preparation of microlessons and appraisal format to elicit feedback. Integration of skills, link practice, macroteaching	2.1 Passi, B.K. (ed.) (1976). <i>Becoming a better teacher; A microteaching approach</i> , Ahmedabad: Sahitya Mudranalaya Singh & Sharma. <i>Microteaching-Theory and Practice</i> . Nat'l Psychological Coop, Andhra. Mohan, R (2007). <i>Innovative science teaching for physical science</i> . New Delhi: Prentice Hall
UNIT. III Planning of Instruction and	3.1 To acquaint with Planning of instruction.	3.1 Planning of Instruction - year plan, unit plan, resource unit - Lesson planning - Need, Stages	3.1 Format of Year plan and lesson plan produced in the SCERT hand books may be adopted. The sequencing of a lesson based on Herbartian steps has to be emphasised.	3.1 Any appropriate textbook

Prepared by:

Dr. Manoj Praveen G, Associate Professor, FTC

Mrs. Irshana Shahnaz Ulladan, Assistant Professor, FTC

Pedagogic Analysis (15+20=35 Hours)	<p>3.2 To understand the pedagogy of Physics and Chemistry of 8th standard and 9th standard.</p>	<p>(Herbartian steps) - Lesson plan preparation based on the Constructivist format.</p> <p>3.2 Pedagogic Analysis- Meaning and Steps of Analysis, Pedagogic Analysis of the Physics and Chemistry content portions of 8th and 9th of Kerala state. Use of C.D. ROM such as Encyclopaedia - Britannica, Microsoft Encarta, Edubuntu of it@school, Kerala, EDUBUNTU –exploration of the science resources - Open source, open content in lesson planning.</p>	<p>3.2 The scope and need for pedagogic analysis encompassing content analysis, statement of objectives/outcome, prerequisites, assignments, activities and evaluation procedures may be discussed.</p> <p>Importance of and integrating the mentioned resources in lesson planning need to be emphasised.</p>	<p>3.2 Sivrajan, K and Faziluddin, A. (2005) <i>Science Education</i>. Calicut University: Central Co-operative stores.</p> <p>Mathew, T.K and Mollykutty, T.M (2011) <i>Science Education-Theoretical Bases of Teaching and Pedagogic Analysis-Physical Science and Natural Science</i>.Rainbow Book Publishers</p>
UNIT. IV Techno Pedagogic Content Analysis in Physical Science (15 Hours)	<p>To understand the various aspects of integration of technology, content and pedagogy.</p>	<p>Science teacher as techno pedagogue- techno pedagogic skills and competencies, Digital Resources –CD, DVD, Websites, m-learning. Creating an e-portfolio, Pedagogical designs using ICT in Physical Science- Digital Lesson plans using Web 2.0 tools (Examples: video clips, PhET simulations, Edublogs, Wikispaces, Dynamic Periodic table, Teacher Tube, Computer assisted assessment)</p>	<p>Meaning, features and importance of Techno Pedagogic Content Knowledge Analysis, components: technology knowledge, pedagogical knowledge, content knowledge, pedagogical content knowledge, technological content knowledge, technological pedagogical knowledge.</p> <p>Teacher as a Techno pedagogue: Meaning & Qualities - Interrelationship between Technology, Pedagogy and Contents of science subjects at school level-identify topics in physical science and integrate it with the components of TPCK Analysis- Prepare Digital Lesson Plan for suitable topic -preparation of constructivist lesson plan by integrating ICT</p> <p>E- portfolio – meaning, artefacts as inputs in an eportfolio</p>	<p>https://en.wikipedia.org/wiki/Technological Pedagogical Content Knowledge</p> <p>http://www.tpack.org/</p> <p>www.citejournal.org/articles/v9i1general1.pdf</p> <p>SCERT, Higher secondary and High school science textbooks</p> <p>E- portfolio http://wp.auburn.edu/writing/eportfolio-project/</p>

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UNIT. V Evaluation (4+4+3=15 Hours)	5.1 To understand the evaluation techniques and prepare test items as per the existing state syllabus pattern in Science 5.2 To be aware about CCE 5.3 To develop an idea of evaluation of non cognitive areas	5.1 Evaluation - Different types of test items - merits and demerits. Construction and administration of Achievement tests and Diagnostic tests. 5.2 Continuous and Comprehensive Evaluation, Evaluation Criteria for Assignment, Seminar and Project 5.3 Evaluation of non cognitive areas like creativity, skill, and attitude in science learning contexts	5.1 Free response and fixed response; objective type test items- supply type and selection type; short answer and essay; construction, merits and demerits of each; Teacher made test versus standardized tests; Achievement and diagnostic-process of construction. 5.2 Meaning, Scope and Importance of CCE, Evaluation Criteria (SCERT Handbook format may be utilized) 5.3 Non Cognitive Domain- Objectives in assessing, Difficulties in assessing, Assessment tools and techniques. (observation, inventories, attitude scales, performance tests etc)	5.1 Any appropriate text book Any appropriate text book in Educational Evaluation Ebel, L & Frisbie, A. (1991). <i>Essentials of Educational Measurement</i> . New York:McGraw Hill 5.2 Any appropriate text book Handbook for teachers published by SCERT from time to time. 5.3 Any appropriate text book
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Tasks and Assignments

1. Create an e-portfolio showcasing the skills and learning acquired by the student teacher. This can be done by creating a website and posting artifacts, photos, thoughts, reflections, documents, evidences of skills acquired, new learning acquired etc.
2. Create 5 digital lesson plans using digital taxonomy and incorporating web 2.0 tools.

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Mrs. Irshana Shahnaz Ulladan, Assistant Professor, FTC

**EDU10.12 PROFESSIONALISING PHYSICAL SCIENCE EDUCATION
Handbook**

Contact Hours: 50 (Instruction)

Maximum Marks: 50

(External: 40, Internal: 10)

UNITS	OBJECTIVES	CONTENT	SCOPE	REFERENCES
Unit 1- Reaching out to society (8+7=15hours)	1.1 To appreciate Linking science with society. 1.2 To familiarize the importance of nurturing talented children	1.1 Science as a Social Endeavor; Science and Technology, complementarities between Science and Technology, Scientific Literacy, Influence of science on society. The Science Teacher and Society. Role of science teacher in eradicating superstitions in Society. 1.2 Identifying and nurturing the scientifically Gifted children. Creativity and Critical thinking. NTSE (conducted by NCERT), Olympiad programme in science by HBCSE, KVPY scholarships by the department of science and Technology.	1.1 Science as a Social Endeavor; Science and Technology, Difference between science and technology. Significance and relevance of both. Discussion on how both complement for the progress of humanity. Scientific literacy – Meaning/definition. Characteristics of literate Students. Dual role of science (emancipatory and oppressive). The science teacher and society. Science as a tool for fighting superstitions, fostering logical thinking and instilling scientific outlook in life. 1.2 Characteristics of Scientifically gifted children. Measures to nurture scientific talent. Creativity in science-ways to foster. critical thinking in science NSTSS - NSTS Scheme of NCERT. Objectives of the scheme. NTSE conducted by NCERT, objectives, procedure, Science Olympiad. Nature of exam. KVPY Scholarship. Selection procedure	SCIENCE, ALIENATION AND OPPRESSION by Robert M. Young Retrieved from http://www.human-nature.com/rmyoung/papers/pap103h.htm Emancipatory Science Retrieved from http://www.republicancommunist.org/articles/EL008/EL008Robertson.html http://www.scientificliteracy.org/aboutus.htm http://www.curriculumsupport.education.nsw.gov.au/investigate/index.htm Alsop, S. & Hicks, K. (2003) Teaching science. New Delhi: Kogan page India Private Ltd. Sivarajan, K & Faziluddin, A. (2005) <i>Science Education</i> . Calicut University : Central Co---operative stores. http://www.ncert.nic.in/programmes/talent_exam/pdf_files/Details.pdf Sivarajan, K & Faziluddin, A. (2005) <i>Science Education</i> . Calicut University : Central Co---operative stores.

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Unit II-Co-curricular Activities in Science(13 hours)	2.1 To acquaint with the co-curricular activities in science	2.1 Organization of field trips and study tours, their importance. Science Club - its pattern, organization and activities such as science fairs, science exhibition, Science debates. Community based resources – science exhibitions, fairs, science parks, museums	2. 1. Co-curricular activities need and significance- Fieldtrip and study tour, Meaning – importance/merits/values, steps of organizing. Science Club – Objectives, Organisation, list of activities conducted by Science Club. Science Fair, Science exhibition, and science debates – Objectives, steps of organizing.	2.1 Rajan K. M. , (1999), Perspectives in Physical Science Teaching, Kottayam: Vidyarthimithram. Ahmad J., (2009) Teaching of Biological Sciences. New delhi: PHI Pvt Ltd. Sivarajan, K & Faziluddin, A. (2005) <i>Science Education</i> . Calicut University: Central Co-operative stores
Unit III- ICT for better Teaching-learning (4+4+4=12hours)	To familiarize the IT related professional inputs of teaching	3.1 Educational uses of e-mail, e-discussion, chat, Wiki , Blog in education - how to use blog in education, utilizing social net working effectively, copy right in the digital world, Creative commons license. 3.2 Communication Technology - Technology based new emerging communication media [Tele-conferencing, webinar, video conferencing, micro blogging etc]. Virtual class room and virtual reality, virtual labs (iLab Project at MIT) 3.3 Computer Aided Teaching, Expert System and Intelligent Tutoring Systems, Module preparation for e-content Development, Course ware, Free softwares in Science - Learning Management Systems – MOODLE	3.1 Use and Importance Of chat, E-mail e-discussion, wiki etc. - Concept & use, Familiarizing facilities Available use of blog in education. Creative Commons License – brief descriptions about Attribution CC BY, Attribution-ShareAlike CC BY-SA, Attribution-NoDerivs CC BY-ND, Attribution-NonCommercial CC BY-NC, Attribution-NonCommercial-ShareAlike CC BY-NC-SA, Attribution-NonCommercial-NoDerivs CC BY-NC-ND 3.2 Definitions of terms in Communication Technology- tele conferencing, webinar etc. Use of virtual classroom and virtual lab. 3.3 Use of computers in teaching – as supporting and as a teaching machine. Human Teacher – merits and draw backs. Expert System as the major component of Intelligent tutoring systems,	3.1 Any appropriate text book in Educational Technology 3.2 Creative Commons License https://creativecommons.org/licenses/ 3.2 Definitions of computer related terms may be collected from http://www.webopedia.com/ And detailed explanations from appropriate internet resources 3.4 E-learning methodologies: A guide for designing and developing e-learning-courses Retrieved from http://www.fao.org/docrep/015/i2516e/i2516e.pdf Hyacinth S. Nwana (1990) Intelligent

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			3.4 Course ware – Meaning , Free Software’s in Science - a list of useful softwares and their functions. Moodle – philosophy, pedagogy, usage, moodle site-basic structure, key terms as given in the moodle website	Tutoring Systems: an overview, Artificial Intelligence Review, 4, 251-277 Retrieved from http://tinyurl.com/gqtmqq4 http://docs.moodle.org/23/en/About_Moodle
Unit IV UNIT IV: (10 Hours) The Professional Science Teacher Curriculum (5+6+4=15 hours)	4.1 To be Professional Science Teacher	4.1 Definition of profession, Teaching as a profession - Professional ethics, Traits of professionalism, Teaching competencies required by a science teacher. 4.2 Soft Skills required for a teacher. 4.3 Professional growth of Science teacher. Teaching, Research and Extension, Research journals in Science & science	4.1 Profession – definition. Characteristics of a profession, who is a professional teacher? Professional Ethics – Code of ethics as given by NCTE. Professional elements (traits). Teacher competencies listed by NCTE. 4.2 Soft skills – meaning, significance in teaching. Essential soft skills required for a teacher like leadership skills, communication skills, time management skills, team skills, event management skills etc. 4.3 Professional growth of science teacher – teaching research and extension. Improving professionalism by in service courses. Role of SCERT and NCERT in the professional growth of a teacher. Professional organizations of teachers. Research Journals in Science – a list of. A list of internet resources and Websites For the professional growth of science teacher.	4.1 Mohan R., (2011) Teacher Education, NEWdELHI: PHI Learning Pvt Ltd 4.2 Appropriate internet resources. 4.3 Mohan R., (2011) Teacher Education NEWdELHI: PHI Learning Pvt Ltd. 4.4 Appropriate internet resources

Tasks and Assignments

Do any one of the given two.

1. Prepare a poster including the main points of any of the three schemes 1. NTSE 2. Olympiad programme 3. KVPY scholarship.
2. Prepare a summary of an article related to science education from an e-journal

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