

MANGALORE UNIVERSITY
DEPARTMENT OF EDUCATION
M.Ed.

MES551 (b) - SP: 11 - Theme A /Theme B

Theme Based Specialization Course - I

Theme A: Pedagogy, Technology and Assessment in Education

Pedagogy and Methodology of Teaching Science

(Elementary/Secondary and Senior Secondary Education)

Objectives / Course Outcome

To understand the nature of science as a dynamic, expanding body of knowledge.

- To enable the students to understand the objectives of teaching science.
- To assimilate the features of contemporary science education.
- To explore the areas of paradigm shifts in science education.
- To know about and to critically study the innovative curricular efforts in India and abroad.
- To develop the skills needed for devising the science curriculum and for developing support materials for curriculum transaction.
- To develop the ability and skills for evaluating the range of outcomes in science education.
- To understand the role of assessment in science education.
- To internalize the importance of Science as a tool for social change
- To understand the relevance of planning and management in Science instruction
- To acquaint student teachers with the strategies and models of teaching for future improvement.
- To equip the student teachers for meeting the needs of individual learners.
- To know about the scope of information communication technology in science education.
- To understand the strategies for providing motivation in science classroom.
- To equip the students for designing dynamic instructional strategies for science education.
- To empower and energize for facing challenges of information technology.
- To envisage a holistic approach towards science education.
- To understand the research findings in science education for improving practices related to science education.
- To acquaint student teachers with the strategies and models of teaching for future improvement.
- To equip the student teachers for meeting the needs of individual learners.
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- To understand the strategies for providing motivation in science classroom.
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- To envisage a holistic approach towards science education.
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Unit 1: Nature and Goals of Modern Science Education

- a. Science -Nature and Scope.
- b. Development of Science over the Centuries.
- c. Social Functions of Science: Social and Personal Values of Science Education.
- d. Science Education in the Modern Perspectives- Nature and use of Scientific Method.
- e. Science and Philosophy: Empiricism, Positivism and Constructivism.
- f. Scientific Literacy.
- g. Process Skills in Science: Basic Processes, The integrated Processes-Its Application.
- h. Integrating Life Skills in Science Teaching.
- i. Relevance of Science Education at Primary, Secondary and Tertiary levels.

Goals of Science Education:

- a. International Goals of Science Education, Science Technology and Society (STS) Goals.
- b. National Goals of Science Education given by various Education commissions, National Curriculum Frame Work-2005
- c. Taxonomies of Educational Objectives: Cognitive, Affective and psychomotor. Taxonomies of Bloom, Simpson, Dave, Anderson and Krathwohl, Mc Comark and Yager. Integrating the taxonomies for Science educationd. Specific Performance objectives of Physical Science/Biological Science (according to own discipline).

Science as an Agent of Social Change:

- a. Role of Science teacher in creating awareness regarding:
- b. Socially relevant scientific issues- Environmental pollution and sustainable development, Conservation of natural resources, Global warming and climate changes, Waste disposal, e-waste, waste water management, drainage, scarcity of drinking water.
- c. Agriculture – Organic farming, Bio fertilizers, Biogas plant, Vermicomposting, GM foods/BT crops, GURTs, Terminator seeds, popularizing indigenous plant varieties and animal breeds.
- d. Health and hygiene - food adulteration, healthy food habits, life style diseases, contagious diseases and precautionary measures, sanitation, family planning, sex education.
- e. Social evils and gender issues.

Unit 2: Science Curricula

- a. Curriculum Development Approaches: Unified, Disciplinary, Interdisciplinary, Integrated, Correlated. Patterns: Subject centered, Teacher initiated, Learner initiated.
- b. Characteristics of significant Curricular Experiments In Abroad: PSSC, HPP, CHEM, CBA, BSCS, Nuffield sciences, SAPA. In India: Reforms by NCERT, SSA, DPEP, NCF. Reforms by SCERT.
- c. Science syllabus revision in Karnataka Modernisation of the Science Syllabus from primary to Higher secondary level (Critical Study of Syllabus, Teacher's Hand Books, Textbooks, Guidebooks and other Auxiliary Materials) significance of My Science Diary.
- d. An Assessment of the learner-centered/Activity oriented curriculum.

Unit 3: Science Instruction

3.1 Planning and Management:

- a. Academic, Administrative and Financial Facilities available for promoting Science Teaching. Science Fairs, Science Clubs, Field Trips and National Talent Search Exams.
- b. Hindrances to Science Instruction - Academic hazards, Administrative, Financial Hazards and lack of Resources.
- c. Professional Competencies and challenges of science Teachers.
- d. Components of classroom Management.
- e. Programmes for Science teachers-Staff Development.
- f. Coping Strategies for teacher's Stress, Burnout.
- g. Extension Activities for Science Teachers.

3.2 Strategies of Science Instruction

- a. Problem Solving, Concept mapping, Mind mapping, Teaching portfolio, Brain storming, Simulation, Analogies, Mnemonics, Problem based learning, Brain based learning, Blended strategies. Using graphic organizers for Science Education.
- b. PSI Programmed Learning, Modules, Contract Learning, Auto Lecture.
- c. Peer Tutoring, Team Learning, Community Based Science Teaching
- d. Tapping the hidden curriculum in Work Experience.
- e. Enrichment programmes for the gifted in Science.

3.3 Instructional Dynamics of Science Education

- a. Approaches: Process and Product Approach by AAAS, Enquiry Approach, Schwab's stable and Fluid Enquiry Approach, Pure Discovery and Guided discovery Approach, Environment Approach, Inductive – Deductive Approach, Conceptual – Factual Approach, Constructivist Approach, Issue Based Approach, Self Directed Learning.
- b. Models: Cognitive growth model, Concept Attainment model, Advance Organizer model, Inquiry Thinking model, Inductive thinking model, Creativity learning model, Tobin – Capie process model, Constructivist learning Model – 5E,7E & Generative Learning Model.

Unit 4: Evaluation and Information Technology

- a. Internal and External evaluation, Formative and Summative Evaluation, Continuous and Comprehensive Evaluation, Criterion Referenced-Norm Referenced Evaluation.
- b. Assessing Process Skills in Science.
- c. Diagnostic tests, Teacher-made tests and Standardized Test in Science.
- d. Techniques of Evaluation involved in continuous and comprehensive Evaluation and grading.
- e. Evaluating Projects, Seminars and group discussions, Symposia.
- f. Online Assessment – Cyber coaching.
- g. Authentic Assessment using Portfolios/Rubrics.

Impact of Information technology:

- a. Impact of IT, Application of CAI/CAL, CBI/CBT, CMI.
- b. IT for secondary storage – CD/Floppies and Pen drives, Virus and Antivirus Programmes.
- c. Multimedia Equipments – Power Point presentation, Microphone, Printer, Scanner, Digital Camera, Web camera, Joystick, LCD, DVD, Handheld computers.
- d. Use of IT for Science learning.
- e. Familiarising with Internet: www, modems, TCP/IP.
- f. Impact of smart classes in Education.
- g. Utilizing major services of the internet: Browsing educational sites, Email, Voice mail, News Group chat, Search engines for Science learning.
- h. Validation of information on the web.

Weaving e learning into science classroom:

- a. Scope of EDUSAT in the teaching learning process.
- b. Web based classroom learning process, online learning, web tools for schools-blogs, RSS, Podcasting, Wikis.
- c. Virtual Learning – Educational Value, factors promoting it, Problems of Virtual classrooms and their solutions, Virtual Libraries and Virtual References.
- d. Scope of e- journals, e- books, e- projects and e- portfolios to nourish the Science Education. Computer programs/used in virtual classrooms-linux, ubuntu, moodle, IT @ school mission.
- e. M learning
- f. Tele conferences

Research Perspectives:

- a. Review of research done in areas – Variables related to Science Achievement, Studies on Science Curricula, Efficiency of instructional models and other Strategies.
- b. Science Education areas in which more research is needed.
- c. Developing Research Attitude: Research Journaling.

Practicum:

- **Preparing an instructional module on any topic in Science.**
- Preparing lesson transcript based on any two innovative techniques.
- Familiarizing modern trends in lesson planning/lesson designing.
- Preparing lesson designs which differentiate enquiry – inquiry learning models.
- Prepare a report on social evils in today's society and suggest ways to eradicate it as a science teacher.
- Prepare a report on the sanitation facilities in the schools of your area.
- Critically analyse the recent Science syllabus revision in Kerala.
- Reviewing of research done in any area related to Science
- **Develop a CD/software for innovative Curriculum transaction based on the salient feature of new digital era.**
- Preparation of a multisensory learning package on any topic of your choice.
- Suggest any 5 web resources (with web address) which enhances for the effective science instruction.
- Prepare teachers portfolio based on select topic
- Construct and standardize an achievement test on any topic of Physics/Chemistry text, Kerala Syllabus.
- Construct a test for assessing process skills of secondary school students.

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