Miami Dade College

SCE4362 Methods of Teaching Science

SCE4362 **Methods of Teaching Science**

Course Description: The student will develop theoretical knowledge and skills that are essential for successful K-12 science instruction. The student will learn to design, implement, and assess science instruction and curriculum utilizing the inquiry method, educational neuroscience research, and best practices that accommodate the learning needs of a diverse population. Fifteen hours of clinical experience are required. (3 hr. lecture) Pre/Corequisite: EDF4430

Course Competency	Learning Outcomes
Competency 1: The student will **analyze and apply local, state, and national standards** by:	3. Critical thinking
1. Summarizing the primary features and goals of state and national standards. Defining scientific literacy and evaluating its importance in society and science for all. Relating and integrating the subject matter with other disciplines and life experiences. Interpreting state-wide and national standardized assessments that measure scientific literacy. Identifying and accessing resources and activities for science education that are aligned to the standards.	
Competency 2: The student will **explain how students construct scientific understanding** by:	3. Critical thinking
1. Comparing and contrasting the difference between inert and meaningful knowledge. Categorizing the three types of knowledge- content, procedural, and metacognitive. Recognizing the importance of student's prior knowledge to learning new scientific information. Identifying instructional strategies to facilitate all students' metacognitive skills in science and reading. Critiquing examples of teaching to determine if they represent receptional (passive) or transformational (active) approaches to science teaching and learning. Scaffolding to help all students accomplish a learning task. Discussing how authentic tasks help students participate and stay interested in science, particularly groups that have been traditional underserved and underrepresented in science.	
Competency 3: The student will **use a variety of science teaching approaches** by:	3. Critical thinking 10. Environmental Responsibility
1. Explaining the value of using a variety of science teaching approaches to meet national and state standards, particularly groups that have been traditionally underserved and underrepresented in science. Observing, journaling and critiquing instructional approaches used in science teaching. Identifying and interpreting strategies that can be used to help all students learn science. Examining strategies that reveal, support, and challenge student thinking. Applying research-based instructional practices for developing students' critical thinking. Engaging in science education professional development activities sponsored by National, State, and/or Local professional organizations. Identifying and selecting a variety of instructional strategies that foster critical and creative thinking such as inquiry-based learning, discovery, and problem solving that respond to cultural, linguistic, and gender differences. Applying research-based instructional practices for developing instructional	

units that incorporate inquiry.	
Competency 4: The student will **plan a curriculum emphasizing the development of students' science concepts** by:	4. Information Literacy 5. Cultural / Global Perspective
1. a. Identifying and sequencing science learning activities that are in concert with brain research. b. Identifying materials based on instructional (long term and short term) objectives and all student learning needs and performance levels.c. Identifying appropriate references, activities, materials, and technology for science based on students' abilities, needs, interests, and backgrounds. d. Interpreting and developing various criteria for the design of the specific scope and sequence of a science curriculum framework with reference to both state and national science standards. e. Locating resources and/or persons from the local and statewide community to assist in the instructional process. f. Interacting with colleagues, supervisors, and students to develop effective lesson plans. g. Identifying teacher behaviors that indicate sensitivity to race, gender, ethnicities, socioeconomic status, abilities, and religion. h. Selecting and developing instructional materials that respond to cultural, linguistic, and gender differences. i. Interpreting and utilizing the learning cycle as a mechanism for building a curriculum that emphasizes the development of students' science concepts to meet national and state standards, particularly groups that have been traditionally underserved and underrepresented in science. j. Planning and applying lessons and assessments that incorporate the learning cycle. k. Reflecting on the implementation of lessons that incorporate inquiry and describing ways in which to improve their teaching.	
Competency 5: The student will **develop communities of science learners that reflect the intellectual rigor of scientific inquiry and the attitudes and social values conducive to science learning** by:	1. Communication 5. Cultural / Global Perspective
1. Identifying appropriate techniques for utilizing science process skills and leading science discourse. Engaging students successfully in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences in a scientific manner. Orchestrating discourse among all students about scientific ideas and processes. Encouraging respect for the diverse ideas, skills, experiences, cultural, and family background of all students in their classrooms. Facilitating ongoing formal and informal discussion based on a shared understanding of rules of scientific discourse. Modeling and emphasizing the skills, attitudes, and values of scientific inquiry.	
Competency 6: The student will **uphold the legal and ethical responsibilities for the welfare of their students, the proper treatment of animals, and the maintenance and disposal of materials** by:	7. Ethical Issues
1. a. Analyzing the effectiveness of science teachers' strategies and procedures for managing laboratory and hands on science lessons. b. Designing the physical environment for laboratory activities to provide optimal learning opportunities for all students. c. Analyzing a variety of classroom demonstrations, field experiences and laboratory experiments for safety concerns and planning effective strategies for avoiding accidents. d. Discussing the legal issues associated with laboratory and field trip experiences. e. Interviewing a high school science teacher and science department chair about the procedures and problems in obtaining needed chemicals and equipment for laboratory experiments, laboratory safety issues, the regulations involving science stockrooms including local fire codes as well as OSHA regulations, the safe disposal procedures for various types of substances, and information contained in the Material Safety Data Sheets. f. Preforming a site visit to a science stockroom and detailing the	

kinds of chemicals needed for each of the sciences, how the chemicals are organized and stored, the equipment needs of each science, and how the equipment is organized and stored. g. Developing a Science Safety Contract for use in their classrooms.	
Competency 7: The student will **demonstrate the ability to plan and implement research based science instruction** by:	2. Numbers / Data 3. Critical thinking 4. Information Literacy 5. Cultural / Global Perspective 7. Ethical Issues 8. Computer / Technology Usage
1. FEAPs 1a. Aligning instruction with state-adopted standards at the appropriate level of rigor. 1b. Sequencing lessons and concepts to ensure coherence and required prior knowledge. 1f. Developing learning experiences that require students to demonstrate a variety of applicable skills and competencies. 2a.Organizing, allocating, and managing the resources of time, space, and attention. 2b. Managing individual and class behaviors through a well-planned management system. 2c.Conveying high expectations to all students. 2d. Respecting students' cultural, linguistic, and family background. 2e.Modeling clear, acceptable oral and written communication skills. Defining science process skills (e.g., observing, inferring, classifying measuring, predicting, and communicating) and the characteristics of each skill. 2f. Maintaining a climate of openness, inquiry, fairness and support. 2h.Adapting the learning environment to accommodate the differing needs and diversity of students. 3a.Delivering engaging and challenging lessons. 3d.Modifying instruction to respond to preconceptions or misconceptions. 3f. Employing higher-order questioning techniques. 3g.Applying varied instructional strategies and resources, including appropriate technology, to comprehensible instruction and to teach for student understanding. 4b.Designing and aligning formative and summative assessments that match learning objectives and lead to mastery. 5a. Designing purposeful professional goals to strengthen the effectiveness of instruction gased on students' needs. 5b. Examining and using data-informed research to improve instruction and student achievement. 5c. Using a variety of data, independently, and in collaboration with colleagues, to evaluate learning outcomes, adjust planning, and continuously improve the effectiveness of the lessons. 5e. Engaging in targeted professional growth opportunities and reflective practices, both independently and in collaboration with colleagues. 5f.Implementing knowledge and skills learned in professional development in the teaching and learning process. 6a. Applying the Code of Ethics and Principles of Professional Conduct to professional and personal situations.	