



Course Description

EEC4219C | Science, Technology, and Mathematics (STEM) Methods for ECE II | 3.00 credits

The student will learn to use scientific and mathematical research-based methods and strategies to teach inquiry and problem-solving skills and plan activities for young children that foster exploration in the nature of science, mathematics, and technology. (Ten hours of clinical experience required in an approved kindergarten-third grade inclusion setting with ESOL students during math and science instruction: 1 observation.)

Course Competencies

Competency 1: The student will identify learning outcomes for children in K-3 in science by:

1. Describing children's process of scientific inquiry (observing, predicting, measuring, interpreting results), its application to the K-3 indoor and outdoor learning environments, and specific strategies teachers can use to facilitate inquiry throughout the K-3 curriculum, adapting as appropriate to meet the needs of all learners, including English Language Learners (ELL) and children with special needs
2. Summarizing appropriate science concepts for young children, including the nature of matter (solids, liquids, gases, air, magnets), life science (plants, animals, life cycles, species), physical science (sounds, vibrations, energy, kinetic and potential energy, inertia, friction, simple machines), and earth and space science (gravity, direction, seasonal changes, fossils)
3. Describing how the development of scientific concepts promotes children's thinking, and reasoning skills and how these skills progress from concrete to semi-concrete to abstract
4. Explaining how to promote children's cognitive development, problem solving and reasoning skills, and understanding of their world through active, hands-on exploration of science concepts and processes
5. Developing lesson plans for K-3 classrooms that promote children's scientific thinking ability throughout the curriculum by providing opportunities to observe, describe, hypothesize, document, measure, classify, order, and evaluate
6. Summarizing ways to nurture children's natural curiosity by encouraging them to explore and make discoveries about their world by using their senses to gain information, make observations, create hypotheses, draw conclusions, and report outcomes
7. Facilitating appropriate ways for children in K-3 classrooms to represent and communicate their scientific hypotheses and knowledge verbally and in writing with pictures, graphs, tables, words, symbols, and other strategies
8. Explaining how instructional methods and strategies involving various types of thinking, such as exploration, discovery learning, making and testing hypotheses, and problem solving can enhance children's scientific understanding and their vocabulary
9. Emphasizing the learning of science and engineering practices, including asking questions and defining problems; developing and using models; planning and carrying out investigations; analyzing and interpreting data; using mathematics and computational thinking; constructing explanations and designing solutions; engaging in argument from evidence; and obtaining, evaluating, and communicating information.
10. Adapting science activities, materials, equipment, environments, and flexible grouping of children to meet the needs of all learners, including ELL and children with special needs
11. Identifying community resources for field trips, including those in nature, to facilitate young children's development of science concepts
12. Evaluating the relationship between claims, evidence, and explanation

Competency 2: The student will identify learning outcomes for children in K-3 in math by:

1. Summarizing the sequential development of mathematical concepts, including number concepts and number sense, developing meaning for the operations and solving story problems, addition, subtraction, multiplication, base-ten concepts, patterns, place value, whole number computation, geometric thinking and geometric concepts, measurement, estimation, early fractions, algebraic reasoning, using data, and

probability

2. Describing how the development of mathematics and scientific concepts promotes children's thinking and reasoning skills and how these skills progress from concrete to semi-concrete to abstract
3. Explaining how to promote children's cognitive development, problem solving and reasoning skills, and understanding of their world through active, hands-on exploration of math concepts and processes
4. Developing lesson plans for K-3 classrooms that promote children's mathematics thinking ability throughout the curriculum by providing opportunities to observe, describe, hypothesize, document, measure, classify, order, and evaluate
5. Facilitating appropriate ways for children in K-3 classrooms to represent and communicate their mathematical knowledge verbally and in writing with pictures, graphs, tables, words, symbols, and other strategies
6. Explaining how instructional methods involving various types of thinking, such as exploration, discovery learning, making and testing hypotheses, and problem solving can enhance children's mathematical understanding and their vocabulary
7. Adapting math activities, materials, equipment, environments and flexible grouping of children to meet the needs of all learners, including ELL and children with special needs

Competency 3: The student will identify and use the Standards for Mathematical Practice in order to develop mathematical concepts in their students by:

1. Making sense of problems and persevering in solving them
2. Reasoning abstractly and quantitatively
3. Modeling with mathematics
4. Constructing viable arguments and critiquing the reasoning of others
5. Using appropriate tools strategically
6. Attending to precision
7. Looking for and making use of structure
8. Looking for and expressing regularity in repeated reasoning

Competency 4: The student will identify developmentally appropriate uses of technology with children by:

1. Evaluating the research about appropriate uses of technology with children and how these strategies vary by the age and developmental level of the children
2. Identifying strategies to appropriately integrate technology into K-3 classrooms
3. Discussing how technology can be integrated into the K-3 classroom to support development of math and science concepts throughout the curriculum
4. Analyzing considerations of science technology in society including cultural, ethical, economic, political, and global implications
5. Evaluating books, software, manipulatives, music, and other materials designed to enhance math and science concepts among children in K-3 classrooms for developmental appropriateness and adaptability across varied knowledge levels, learning styles, and proficiency in English

Competency 5: The student will identify methods of program and setting evaluation and uses for evaluation results by:

1. Describing techniques for integrating math and science concepts throughout the daily curriculum
2. Utilizing observation and assessment as a basis for lesson planning and planning math and science discovery experiences for individual children that reflect knowledge of their learning style, English proficiency, prior knowledge, and special needs
3. Explaining how assessment is adjusted for children with special learning needs or English Language Learners and interpreted and used to inform developmentally appropriate learning activities that meet the needs of all children
4. Using a variety of assessment strategies to monitor children's progress in achieving outcomes and planning learning activities
5. Interpreting state-wide and national standardized assessments that measure science and math literacy

Competency 6: The student will identify state standards and national standards, policies, and position statements for young children by:

1. Reviewing, evaluating, and integrating position statements by professional organizations related to math, science, and technology into daily practice with young children
2. Regularly using the Next Generation Sunshine State Standards for Science and the Common Core State Standards for Mathematics, to inform lesson planning, activity implementation and evaluation
3. Researching national standards, policies, and position statements to inform knowledge, lesson planning and daily practice in the K-3 classroom

Competency 7: The student will plan a curriculum emphasizing the development of students' science, math, and computer concepts by:

1. Identifying and sequencing science, math, and technology learning activities that are in concert with brain research and developmentally appropriate practice
2. Identifying materials based on instructional (long and short term) objectives and all student learning needs and performance levels
3. Interpreting and developing various criteria for the design of the specific scope and sequence of science and math curricula with reference to both state and national standards
4. Developing rubrics to assess science, math, and technology learning
5. Interpreting and utilizing the learning cycle as a mechanism for building curricula that emphasize the development of students' science and math concepts to meet national and state standards, particularly groups that have been traditionally underserved and underrepresented in science and math

Competency 8: The student will apply knowledge of instructional delivery and facilitation through a comprehensive understanding of subject matter by:

1. Aligning instruction with state-adopted standards at the appropriate level of rigor
2. Sequencing lessons and concepts to ensure coherence and required prior knowledge
3. Designing instruction for students to achieve mastery
4. Selecting appropriate formative assessments to monitor learning
5. Using diagnostic student data to plan lessons
6. Developing learning experiences that require students to demonstrate a variety of applicable skills and competencies

Competency 9: The student will maintain a student-centered learning environment that is safe, organized, equitable, flexible, inclusive, and collaborative by:

1. Organizing, allocating, and managing the resources of time, space, and attention
2. Managing individual and class behaviors through a well-planned management system
3. Conveying high expectations to all students
4. Respecting students' cultural, linguistic, and family background
5. Modeling clear, acceptable oral and written communication skills
6. Maintaining a climate of openness, inquiry, fairness, and support
7. Integrating current information and communication technologies
8. Adapting the learning environment to accommodate the differing needs and diversity of students
9. Utilizing current and emerging assistive technologies that enable students to participate in high-quality communication interactions and achieve their educational goals

Competency 10: The student will utilize a deep and comprehensive knowledge of the subject taught by:

1. Delivering engaging and challenging lessons
2. Deepening and enriching students' understanding through content area literacy strategies, verbalization of thought, and application of the subject matter
3. Identifying gaps in students' subject matter knowledge
4. Modifying instruction to respond to preconceptions or misconceptions
5. Relating and integrating the subject matter with other disciplines and life experiences

6. Employing higher-order questioning techniques
7. Applying varied instructional strategies and resources, including appropriate technology, to provide comprehensible instruction and to teach for student understanding
8. Differentiating instruction based on an assessment of student learning needs and recognition of individual differences in students
9. Supporting, encouraging, and providing immediate and specific feedback to students to promote student achievement
10. Utilizing student feedback to monitor instructional needs and to adjust instruction
11. Identifying key concepts in: earth and space, physical, and life sciences
12. Identifying key concepts in: algebraic thinking, number concepts and operations in base ten, measurement and data collection and analysis, geometric and spatial concepts

Competency 11: The student will understand and apply continuous professional improvement, responsibility, and ethical conduct by:

1. Designing purposeful professional goals to strengthen the effectiveness of instruction based on students' need
2. Examining and using data-informed research to improve instruction and student achievement
3. 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
4. Collaborating with the home, school, and larger communities to foster communication and to support student learning and continuous improvement
5. Engaging in targeted professional growth opportunities and reflective practices, both independently and in collaboration with colleagues
6. Implementing knowledge and skills learned in professional development in the teaching and learning process, adjust planning, and continuously improve the effectiveness of the lessons

Competency 12: The student will identify and be able to select, adapt and use a wide range of standards-based materials, resources, and technologies by:

1. Using culturally responsive/sensitive, age-appropriate and linguistically accessible materials for ELLs of diverse backgrounds and varying English proficiency levels
2. Using a variety of materials and other resources, including L1 resources, for ELLs to develop language and content-area skills
3. Using technological resources (e.g., Web, software, computers, and related media) to enhance language and content-area instruction for ELLs of diverse backgrounds and varying English proficiency levels

Competency 13: The student will know, understand, and apply concepts, research, best practices, and evidenced-based strategies to plan classroom instruction in a supportive learning environment for ELLs. The teacher will plan for multilevel classrooms with learners from diverse backgrounds using a standard based ESOL curriculum. Teachers will know, select, and adapt a wide range of standards-based materials, resources, and technologies by:

1. Planning for integrated standards-based ESOL and language sensitive content instruction
2. Creating supportive, accepting, student-centered classroom environments
3. Planning differentiated learning experiences based on assessment of students' English and L1 proficiency and integrating ELLs' cultural background knowledge, learning styles, and prior formal educational experiences
4. Planning learning tasks for particular needs of students with limited formal schooling (LFS)
5. Planning for instruction that embeds assessment, includes scaffolding, and provides re-teaching when necessary for individuals and small groups to successfully meet English language and literacy learning objectives
6. Selecting and adapting culturally responsive/sensitive, age-appropriate, and linguistically accessible materials
7. Selecting and adapting a variety of materials and other resources including L1 resources, appropriate to

ELLs' developing English language and literacy

8. Selecting technological resources (e.g., Web, software, computers, and related media) to enhance instruction for ELLs of diverse backgrounds and at varying English proficiency levels

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Use quantitative analytical skills to evaluate and process numerical data Information Literacy
- Formulate strategies to locate, evaluate, and apply information