

# Draft Draft

Miami Dade College  
EDE 4304  
Integrated Mathematics and Science

**Course description:** This course provides theoretical and practical frameworks for teaching math and science K-12, using approaches to accommodate learning needs of LEP students and students with various disabilities. Provides practical methods for integrating math and science concepts into other curriculum areas. Addresses specific Sunshine State Standards, subject matter competencies and pedagogy pertinent to the disciplines required for certification, Council for Exceptional Children's Content Standards for All Beginning Special Education Teachers. Minimum 20 hours structured field experience required. Prerequisites:

Three credits

**Competency 1:** The prospective teacher will demonstrate the ability to explain and address common reasons students with learning problems have difficulty with traditional math and science curricula. To this end they will be able to

- a. Identify which factors, in addition to knowledge of mathematics and science can affect students' ability in those areas.
- b. Determine that students understand the meaning of a mathematical operation and not just the answer to the problem.
- c. Analyze instructional methods in relation to student needs.
- d. Explain what is meant by high-incidence disabilities including their prevalence and the key elements of the federal definitions for each of the high-incidence categories.
- e. Create assessments that allow for differences understanding, creativity and accomplishment.
- f. Describe the characteristics and needs of students with communication disorders, physical disabilities, visual limitations, learning and emotional disabilities, hearing disabilities and explain possible classroom adaptations.
- g. Describe ways to adapt report card grades.
- h. Demonstrate an understanding of the significance of the concepts of learning modalities, learning styles, and learning capacities, and their implications for appropriate practice.
- i. Construct assessment plans that are compatible with teaching goals and methods and that allow for multiple ways of representing knowledge.

- j. Have a solid understanding of the concepts taught in elementary and secondary school mathematics.
- k. Use and encourage problem solving as an integral part of mathematics.

**Competency 2:** The prospective teacher will develop the means to promote and support children's efforts at problem solving in the math and science classroom. To this end they will be able to

- a. Provide access to male and female mentors who represent diverse linguistic and cultural groups, as well as individuals with disabilities.
- b. Explain the differences between traditional grouping practices and current trends in instructional grouping.
- c. Describe the advantages and disadvantages of same and mixed-ability groups.
- d. Plan for multiple grouping structures in their classrooms.

**Competency 3:** The prospective teacher will be knowledgeable in locating and utilizing resources and material to enhance their teaching. To that end they will be able to

- a. Identify resources which will reinforce, support the teaching and learning of science and mathematics e.g. people resource, multimedia, informal learning settings, professional journals and conferences.
- b. Demonstrate the ability to utilize the Internet to locate math and science lesson plans.

**Competency 4:** The prospective teacher will be knowledgeable in ways to develop effective strategies which will guide students in the development of their problem solving strategies. To that end they will be able to

- a. Adapt lessons when students do not have the preskills in science and mathematics necessary to learn new skills.
- b. Explain how performance-based and portfolio assessments can be used for students with disabilities.
- c. Appreciate the variety of strategies that students use to solve problems,

- d. Formulate questions which will reveal children's construction of meaning in science and math;
- e. Demonstrate understanding of the problem-solving process, knowledge of problem-solving skills and strategies, their application in teaching, and an awareness of one's own problem-solving abilities.

**Competency 5:** The prospective teacher will demonstrate the ability to recognize and explain the various gender and diversity issues related to the teaching and learning of math and science. To this end they will be able to

- a. Demonstrate knowledge of various forms of assessment in science education, and an understanding of assessment strategies to use with students with special needs including language minority students.
- b. Explain how children, including special needs students and language minority students, learn science.
- c. Describe the current reforms in science education i.e. involving students in learning through hands-on activities to which they can relate, and involving students in active inquiry.
- d. Compare and contrast the current goals of science education with past goals i.e. switch from science for scientific specialists to science as an integral part of everyday life.
- e. Analyze the impact the current goals of science education have on the lives of all students.

**Competency 6:** The prospective teacher will demonstrate an appreciation for the various ethical considerations relative to the teaching of mathematics and science. To this end they will be able to

- a. Discuss issues, ethics, and laws related to the teaching of mathematics and science, and students with disabilities.
- b. Cite examples in current events where members of the education profession were involved with ethical decisions relative to the assessment process.

- c. Demonstrate a positive and supportive attitude toward teaching science and mathematics, in an integrative approach, as well as to students having a wide range of disabilities.
- d. Honestly confront their own feelings toward students with disabilities in order to be able to provide a safe, stimulating environment and to act as advocate if need be.

**Competency 7:** The prospective teacher will demonstrate knowledge and ability to organize and manage a variety of learning groups/settings, and take into account learner needs and interests as well as lesson goals, and demonstrate flexibility in adapting plans in response to changes in classroom environment. To that end they will be able to

- a. Design math problem-solving activities for students with disabilities, learning difficulties, communication disorders and limited English proficiency.
- b. Make adaptations in the classroom materials and activities for teaching mathematics and science to students with moderate to severe disabilities.
- c. Sequence learning from a real experience and to the more abstract form of experience.
- d. Describe and discuss the scope and sequence of mathematic and science concepts and skills taught from kindergarten through the twelfth grade.
- e. Identify and be able to use those curriculum resources which are especially helpful for students with disabilities and learning problems

**Competency 8:** The prospective teacher will demonstrate their ability to describe adaptations that can be made in providing background knowledge, organization content, and teaching terms and concepts to help students acquire academic content. To this end they will be able to

- a. Teach science and mathematics through the use of interdisciplinary thematic units.
- b. Outline the role of the general education teacher in the procedures and services of exceptional student education.
- c. Identify local resources in the community for potential materials and equipment for science instruction.

- d. Design and deliver science and mathematics lessons and units that are developmentally appropriate and sensitive to the needs, values, and interests of a diverse group of students.
- e. Understand and apply the basic theoretical and practical perspectives behind project-based, problem-based, case-based, Science/Technology/Society orientations, and science as inquiry
- f. Examine the entire school curriculum to identify possible cross-curricular integration of science and mathematics with other disciplines.
- g. Extend mathematics and science concepts beyond the classroom by providing a diversity of problems and applications.
- h. Select and sequence instructional examples in science and mathematics to help students acquire basic skills.
- i. Express their own personal philosophy toward teaching science and mathematics through an integrative approach, and the inclusion of students with a wide range of disabilities.

**Competency 9:** The prospective teacher will demonstrate ability to design a complete integrated mathematics and science unit. To this end they will be able to

- a. Analyze the research in learning and memory which affect the learning of science and mathematics in multi-cultural and multilingual contexts.
- b. Identify the trends in technology related to science and mathematics education and how these trends have been used to facilitate students' acquisition of scientific and mathematical knowledge.
- c. Apply teaching methods that help students construct their own understanding of scientific concepts, skills and attitudes as measured by a skills matrix.
- d. Identify any assistive technology required by students with disabilities.
- e. Establish peer tutoring programs in inclusive schools and describe the characteristics of those programs.

**Competency 10:** The prospective teacher will demonstrate knowledge of planning instructional activities that integrate science and math across curricular

areas. To this end they will be able to

- a. Identify science program materials and commercial products used in elementary science teaching
- b. Write descriptive and detailed science and math lesson plans based on various models of teaching
- c. Recommend changes to traditional mathematics curricula in order to adequately address the needs of students with disabilities and learning problems.

**Competency 11:** The prospective teacher will demonstrate an awareness of the ramifications of their role as a science and mathematics educator. To this end they will be able to

- a. Discuss the changes over the years in the approaches to mathematics and science education;
- b. Identify the relationships and common themes that connect math, science, and technology
- c. Describe and use the following best practice strategies in teaching students with wide ranges of abilities well together: thematic learning, classroom workshops, authentic learning experiences, small group activities, representing to learn, and reflective assessment.

**Competency 12:** The prospective teacher will demonstrate knowledge of the relevance of technology to the teaching of their particular disciplines. To this end they will be able to

- a. Help students deal effectively with the frustrations which are inherent in using technologies.
- b. Use a wide variety of technologies for enhancing instruction, as well as identifying individuals capable of recommending appropriate assistive technology.
- c. Implement new technologies for teaching mathematics and science.
- d. Describe the advantages and disadvantages of drill and practice software for the instruction of science and math.
- e. Evaluate the pedagogical soundness of math and science lesson

plans available through the Internet;

- f. Develop an integrative unit which incorporates the use of technologies and technological resources by both teacher and students with special emphasis on mathematics and science;