Miami Dade College

Course Description

EDF4994 | Brain-Based Teaching: Mathematics and the Brain | 3.00 credits

The student will learn how the brain processes information and acquires the ability to perform mathematical processes. The student will integrate educational neuroscience, cognitive research-based, instructional practices, and mathematics assessment into the P-12 classroom.

Course Competencies

Competency 1: The student will explain the parts of the brain and their functions as they relate to the teaching and learning process by:

1. Describing the basic anatomy and functions of parts of the brain involved in learning and emotions
2. Identifying the role and importance of neurotransmitters in the learning process
3. Discussing how neuroplasticity impacts the acquisition of new information
4. Examining how emotions impact learning (ex: Positive Psychology as it relates to optimism, empathy, stress, and anxiety)
5. Explaining the interrelationship between cognitive and social-emotional domains in the mathematics learning process
6. Explaining common neurologically-based mathematics challenges (e.g., dyscalculia, dysgraphia, mathematics anxiety, etc.)

Competency 2: The student will examine educational neuroscience and cognitive research and their applications to the teaching and learning of mathematics by:

1. Comparing and contrasting how mathematics has been taught historically to how it is taught today with using educational neuroscience and cognitive research
2. Explaining how the brain develops mathematics skills (e.g., higher order thinking skills, discovering and formalizing patterns, etc.) based on educational neuroscience and cognitive research
3. Understanding how mathematics knowledge is created, produced, and sequenced in different content areas/disciplines (e.g., social studies, science, language arts)
4. Comparing and contrasting educational neuroscience and cognitive research related to equity (e.g., gender, SES, ELL, students with disabilities, gifted, etc.) and learning mathematics

Competency 3: The student will develop a repertoire of instructional strategies and best practices that reflect educational neuroscience, cognitive, and mathematics education research by:

1. Scaffolding mathematics practices supported by educational neuroscience and cognitive research into content areas/discipline lessons
2. Modeling mathematics strategies and activities for different content areas/disciplines
3. Modeling mathematics strategies and activities in different content areas/disciplines that address the different learning profiles and needs of all students (e.g., gender, SES, ELL, students with disabilities, gifted, etc.)
4. Modeling mathematics strategies and activities that students can use to foster metacognition through self-correcting and self-monitoring skills
5. Evaluating content areas/discipline teaching materials to determine alignment with educational neuroscience, cognitive research, and mathematical practices research
6. Identifying educational neuroscience and cognitive research practices in mathematics for families to support home learning

Competency 4: The student will apply assessment practices grounded in educational neuroscience and cognitive research by:

1. Utilizing assessment tools that align with educational neuroscience, cognitive, and mathematics education research to monitor student progress, achievement, and learning gains
2. Selecting assessment methods and strategies aligned with educational neuroscience and cognitive research that meet the needs of all learners (e.g., gender, SES, ELL, students with disabilities, gifted, etc.)
3. Using educational neuroscience research to determine appropriate testing conditions to accommodate students' varying learning profiles and knowledge levels
4. Utilizing mathematics assessment data to promote the academic achievement of a diverse population of learners
5. Utilizing assessment data to meet the needs of diverse learners in content area literacy
6. Utilizing assessment data and mathematics strategies to meet the needs of diverse learners in content area(s)

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Formulate strategies to locate, evaluate, and apply information
- Create strategies that can be used to fulfill personal, civic, and social responsibilities