

# ENDEAVOR STEM CONCENTRATION

## Program Overview

The Master of Arts in Teacher Leadership with a STEM concentration seeks students who wish to enhance their knowledge and ability to deliver content instruction and further develop their leadership skills in educational settings. This program is designed to be developmental and experiential in nature, fostering ethical behavior and the improvement of self and one's profession.

Participants who complete the full master's degree will acquire both content knowledge and the skills needed to be effective teacher leaders in their schools and school districts. The full master's degree program includes both the 21 credit Teacher Leadership core and 15 credits in approved STEM courses. A Capstone Project demonstrating the ability to develop and practice teaching and shared leadership skills is a requirement of this concentration.

## Curriculum Overview

Developed as a partnership between Rider University and the U.S. Satellite (Endeavor) Laboratory, the Master of Arts in Teacher Leadership with a STEM concentration is designed to prepare experienced STEM teachers to assume a greater leadership role in their schools, and share their skills and knowledge while remaining active in the classroom.

## Degree Offered

- M.A. Teacher Leadership with a STEM Concentration

## Contact

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**Program Website:** Teacher Leadership (<https://www.rider.edu/academics/colleges-schools/college-education-human-services/graduate-programs/leadership-programs/graduate-programs-school-leaders/teacher-leaders/>)

**Associated Department:** Department of Graduate Education, Leadership, and Counseling (<http://www.rider.edu/academics/colleges-schools/college-liberal-arts-education-sciences/school-of-education/graduate-programs/>)

## Related Programs

- Teacher Leadership Professional Development Certificate (<http://catalog.rider.edu/graduate/colleges-schools/education/programs-certificates/teacher-leadership-profdev-certificate/>)
- Master of Arts in Teaching (<http://catalog.rider.edu/graduate/colleges-schools/education/programs-certificates/ma-teaching/>)
- Educational Leadership (<http://catalog.rider.edu/graduate/colleges-schools/education/programs-certificates/educational-leadership/>)

- Organizational Leadership (<http://catalog.rider.edu/graduate/colleges-schools/education/programs-certificates/organizational-leadership/>)

## Endeavor STEM Concentration Program Requirements

(15 credits)

Code	Title	Credits
<b>Select up to five of the following courses (not every course is available every semester):</b>		
CURR 660	Authentic Data in the Elementary STEM Classroom.	9-15
CURR 661	Authentic Data in the Secondary STEM Classroom	
CURR 662	Eyes on Earth: Teaching Earth Science from Space (PK-8)	
CURR 663	Lessons from the Ocean: Science on the Water Planet (Grades 2-12)	
CURR 664	The Arts in STEM: Advancing Meaningful Integration (K-12)	
CURR 665	Climate Change with NSF SPRINTT	
CURR 666	Exploring Mars: A New Twist on Science (or Math)	
CURR 667	Physical Science in Motion: Classroom Applications	
CURR 668	Coding, Robotics, and 1:1 Devices	
CURR 669	Culturally Relevant Pedagogy in the STEM Classroom	
CURR 670	Life and Marine Science: Tracking Live Marine Animals	
CURR 672	Math Connections to STEM Education	
CURR 673	NASA Astronomy and Space Science	
CURR 676	The E in STEM: Meaningful Content for Engineering	

**Select no more than two of the following courses (not every course is 0-6 available every semester):**

CURR 517	Teaching and Learning Number and Operations
CURR 518	Teaching and Learning Rational Numbers and Proportional Reasoning
CURR 519	Teaching and Learning Algebraic Reasoning
CURR 520	Teaching and Learning Geometric Understanding
CURR 522	Teaching and Learning Measurement and Data
CURR 640	Teaching and Learning Physical Science
CURR 641	Teaching and Learning Life Science
CURR 642	Teaching and Learning Earth and Space Science
CURR 643	Engineering Solutions to the Challenges of Contemporary Science Issues
CURR 644	Teaching and Learning Chemical Science

**Total Credits: 15**

## Courses and Descriptions

### **CURR 517 Teaching and Learning Number and Operations 3 Credits**

This course provides an in-depth study of the content and pedagogy for understanding early number theory. It addresses students' mathematical understanding of representing numbers, relationships among numbers, and number systems; operations and how they relate to one another; and computation. Strong emphasis is placed on the cognitive development of children's thinking in number and operations, and the instructional, curricular, and assessment implications for teaching. The course includes the NCTM Principles of problem solving, reasoning and proof, connections, communication, and multiple representations and the Common Core State Standards for Mathematics Practices.

### **CURR 518 Teaching and Learning Rational Numbers and Proportional Reasoning 3 Credits**

This course provides an in-depth study of the content and pedagogy for understanding rational numbers and proportional reasoning. Content includes a variety of situations involving proportions, for example, real-world problems involving ratios, rates, and percents; geometry involving similarity; algebra involving linearity; and probability involving assigning a probability to an event. Distinguishing proportional situations from those that are not and reasoning proportionally in appropriate situations are emphasized. Emphasis is placed on children's cognitive development of rational numbers and proportional reasoning, and the instructional, curricular, and assessment implications for teaching. The course includes the NCTM Principles of problem solving, reasoning and proof, connections, communication, and multiple representations and the Common Core State Standards for Mathematics Practices.

### **CURR 519 Teaching and Learning Algebraic Reasoning 3 Credits**

This course provides an in-depth study of the content and pedagogy necessary to facilitate the transition from concrete arithmetic reasoning to abstract algebraic reasoning. It addresses students' mathematical understanding of equality, variable, generalization, and functions; cognitive development of algebraic reasoning; and the instructional, curricular, and assessment implications for fostering algebraic reasoning in students. Strong emphasis is placed on the NCTM Principles of problem solving, reasoning and proof, connections, communication, and multiple representations and the Common Core State Standards for Mathematics Content and Mathematical Practices.

### **CURR 520 Teaching and Learning Geometric Understanding 3 Credits**

This course provides an in-depth study of the content and pedagogy for geometric understanding. It addresses students' mathematical understanding of shapes and their properties, location, transformation of shapes, and visualization; the cognitive development of geometric thinking; and the instructional, curricular, and assessment implications for teaching. Emphasis is placed on the NCTM Principles of problem solving, reasoning and proof, connections, communication, and multiple representations and on the Common Core State Standards for Mathematics Practices.

### **CURR 522 Teaching and Learning Measurement and Data 3 Credits**

This course provides an in-depth study of the content and pedagogy for measurement, data analysis, and probability. Mathematical content includes units, systems, and processes of measurement; techniques, tools, and formulas to determine measurements; data collection and display; statistical methods to analyze data; and, evaluating inferences and predictions. Emphasis is placed on children's cognitive development of measurement and data, and the instructional, curricula, and assessment implications for teaching. The course includes the NCTM Principles of problem solving, reasoning and proof, connections, communication, and multiple representations and the Common Core state Standards for Mathematics Practices.

### **CURR 640 Teaching and Learning Physical Science 3 Credits**

This course provides an in-depth study of content and pedagogy for understanding selected physical science (physics and chemistry) topics aligned with Next Generation Science Standards (NGSS). The course will be structured around big ideas identified in NGSS, common misconceptions, and appropriate learning progressions. While addressing the content, emphasis will also be placed on: effective instructional strategies and science practices through the use and study of such practices and strategies.

### **CURR 641 Teaching and Learning Life Science 3 Credits**

This course provides an in-depth study of content and pedagogy for understanding selected life science topics aligned with state and national standards. The course will be structured around big ideas identified in standards, common misconceptions, and appropriate learning progressions. While addressing the content, emphasis will also be placed on: effective instructional strategies and science practices through the use and study of such practices and strategies.

### **CURR 642 Teaching and Learning Earth and Space Science 3 Credits**

This course provides an in-depth study of content and pedagogy for understanding selected earth and space science topics aligned with state and national standards. The course will be structured around big ideas identified in standards. While addressing the content, emphasis will also be placed on: effective instructional strategies and science practices through the use and study of such practices and strategies.

### **CURR 643 Engineering Solutions to the Challenges of Contemporary Science Issues 3 Credits**

This course provides an in-depth study of the content and pedagogy for understanding selected technology, engineering and design topics aligned with state and national standards. The course will be structured around big ideas identified in standards, common misconceptions, and appropriate learning progressions. While addressing the content, emphasis will also be placed on: effective instructional strategies and science practices through the use and study of such practices and strategies.

### **CURR 644 Teaching and Learning Chemical Science 3 Credits**

This course provides an in-depth study of content and pedagogy for understanding selected chemistry topics aligned with Next Generation Science Standards (NGSS). The course will be structured around big ideas identified in NGSS, common misconceptions, and appropriate learning progressions. While addressing the chemistry content, emphasis will also be placed on: effective instructional strategies and science practices for the K-8 classroom through the use and study of such practices and strategies. Participants will engage in experiences with the states and properties of matter, develop models of the atom, and gain an understanding of the major principles of chemistry. The course will focus on states of matter, characteristic physical and chemical properties of matter, and chemical and physical transformations of matter.

**CURR 660 Authentic Data in the Elementary STEM Classroom. 3 Credits**

Young learners can think deeply about content and make meaningful connections between their experiences, natural phenomena, and authentic data when teachers integrate data in purposeful ways. In this course, teachers construct student-centered STEM investigations integrating real-world scientific and mathematical data and build their understanding of the theoretical basis for this work. Participants gain knowledge of STEM resources, learn to access entry points for STEM in elementary classrooms and foster engaging contexts, like engineering, coding, and NASA mission exploration. Teachers explore the synergies between Common Core State Standards and Next Generation Science Standards for a productive and exciting learning environment that prepares students for ongoing interest in STEM. This course is recommended as a foundation for the STEM certificate program.

**CURR 661 Authentic Data in the Secondary STEM Classroom 3 Credits**

Middle and High School students are capable of deep sense making when teachers utilize engaging STEM classroom practices to teach content with authentic data connections. In this course, teachers learn to apply research-based best practices central to today's classrooms. In a collaborative professional learning environment, they build knowledge of resources for accessing, analyzing, and making use of authentic data in meaningful activities. Coursework includes planning student-centered lessons that integrate data, building cultural relevance with engaging phenomena, and developing meaningful assessments for STEM activities. Participants identify how to integrate engineering design into the STEM classroom and learn how to represent the Nature of Science as students develop conceptual understanding and apply critical thinking to real-world decisions. A library of content rich lessons becomes available to all participants through a shared online community. This course is recommended as a foundation for the STEM certificate program.

**CURR 662 Eyes on Earth: Teaching Earth Science from Space (PK-8) 3 Credits**

This course will take participants through a journey about space exploration and specific NASA missions that examine components of earth. Participants will learn science content grounded in Earth's Lithosphere, Hydrosphere, Atmosphere, and Biosphere. By learning to use authentic data from NASA and other sources participants will experience an exploratory approach to learning about the Earth, and then bring these experiences to their own classrooms. Teachers will utilize several web-based tools and real-time data along with the three-dimensional learning in the Next Generation Science Standards to create lessons that can be used directly in the classroom.

**CURR 663 Lessons from the Ocean: Science on the Water Planet (Grades 2-12) 3 Credits**

Bring the ocean into your classroom by using Earth's waters as a context for standards-based STEM content. The ocean is critical to the functioning of the Earth system, and is an authentically integrated context for learning about topics such as density, weather and climate, heat transport, environmental issues, biogeochemical cycles, mathematics, and much more. Access a myriad of data sets to apply science concepts and make connections between the ocean and atmosphere, living and nonliving parameters, and life on land, as well as in the deep sea. Use the context of the ocean to teach Next Generation Science Standards topics with deep understanding and meaning for learners.

**CURR 664 The Arts in STEM: Advancing Meaningful Integration (K-12) 3 Credits**

Apply art in the context of exciting STEM concepts and learn to integrate art, science, math, technology, and engineering in more meaningful ways in your classroom. At the core of the STEM Education movement are critical thinking, creativity, problem solving, and authentic learning environments that engage diverse students in meaningful ways with content. The many mediums for art and artistic expression are a valuable component of communication and expression. Scientists and researchers at NASA and across the globe use myriad forms of art in their work. This course invites students to take a close look at the incorporation of art in the STEM classroom and provides resources, exemplars, and access to collaborative support for arts integration.

**CURR 665 Climate Change with NSF SPRINTT 3 Credits**

Award-winning curriculum and eloquent, online student investigations help students study science concepts emphasized in the Next Generation Science Standards, in the context of Earth's Polar Regions to better understand the complexity of Earth's climate and how it is changing. View the Earth using real scientific data from satellites and western researchers. Then, consider the lens of indigenous peoples of the Arctic. Examine tons of data and changes in ice, permafrost, weather patterns, biological change, and more as you conduct research with simple-to-use, web-based instructional tools, using authentic data sets and models to study our planet's past, present, and future climate. Interdisciplinary investigations address many Common Core State Standards in reading, writing, science, and technical subjects as well as mathematics in the context of climate science.

**CURR 666 Exploring Mars: A New Twist on Science (or Math) 3 Credits**

Use a wealth of data sets and technological tools to explore and understand features of Earth's neighbor, the Red Planet. Look for and study the physical and chemical evidence of water and ice; compare erosion patterns on Mars and Earth; and make inferences about the planet's history as you study both its geologic features, including volcanoes and craters, and the physics of the atmosphere. Teach Next Generation Science Standards topics in Earth, physical, and chemical science integrating mathematics, in the context of Mars using recent data from Curiosity Rover and other missions.

**CURR 667 Physical Science in Motion: Classroom Applications 3 Credits**

Physical science, when applied, makes tough-to-understand concepts easy and fun. Participants learn to solve problems relating to one-dimensional motion; become acquainted with and apply Newton's Laws of Motion and equilibrium of forces; learn about constant acceleration and gravitational acceleration; investigate concepts in aerodynamics; and learn about two-dimensional motion. Participants will use free, simple-to-use, software simulations from NASA Glenn Research Center, which help to present these concepts for you, and, then, your students, in the context of aeronautics, including airplane design, rocketry, sports, and more. A carefully developed resource page provides access to excellent resources and engaging activities for implementing course content in your classroom with important connections to Next Generation Science Standards and Common Core mathematics.

**CURR 668 Coding, Robotics, and 1:1 Devices 3 Credits**

Learn applications of Coding as a mathematics pedagogy, explore opportunities for Robotics, and learn cutting-edge implementation of One-to-One Devices (1:1) in K-12 classrooms. Participants learn about and explore best practices in the newest learning pedagogies and technologies. Whether you are already involved, or looking to integrate these cutting-edge tools and strategies for the classroom, you will begin to expand your reach for enhancing student learning. Scaffolded to allow success at all grade levels, Coding, Robotics, and 1:1 Devices offers resources for application into elementary, middle, and high school. Participants will interact with no-fee computer programming, robotics opportunities, and the latest uses of devices. All participants have the opportunity to work with innovative technologies and interact with talented educators, practitioners and special guests who are already making a difference in K-12 classrooms.

**CURR 669 Culturally Relevant Pedagogy in the STEM Classroom 3 Credits**

Classrooms comprise individual learners, each bringing their own culture and experiences to the learning environment. The value and strength of diversity has become increasingly described in educational literature. This course introduces teachers to the curriculum and pedagogical issues relevant to race, language, gender, and socio-economic differences. Participants apply content and pedagogy involving science and mathematics contexts for effective learning. STEM activities will integrate meaningful, engaging practices for teaching diverse learners. The course is differentiated for elementary and secondary school educators to provide relevant connections, to be directly applied, in each participant's classroom.

**CURR 670 Life and Marine Science: Tracking Live Marine Animals 3 Credits**

Follow marine animals (e.g., polar bears, sea turtles, sharks, and whales) in real-time, and apply life and Earth science topics to the ocean. Study topics such as ecosystems, biodiversity, cell structures, food webs, and conservation, as you make connections to ocean currents, seafloor features, density and more. Discover the importance of the ocean to humans, as well as our impacts, both positive and negative, on marine environments. The in-depth use of data lends itself to Next Generation Science Standards by integrating instructional technology with life, Earth and physical science.

**CURR 671 Life in Space: NASA ISS and Astrobiology 3 Credits**

The International Space Station (ISS) is an amazing undertaking comprising technology, engineering, science and math—the perfect context for exciting students for learning. NASA research leads to technological advances on Earth and in human space exploration. As NASA plans for manned missions to Mars, scientists explore our solar system and beyond for determining if and where life could exist. Extremophiles are fascinating for teaching Earth science in a context for astrobiology research. The course explores how space travel impacts the human body; growing food in space; engineering protection from radiation, and searching for habitable environments. With its application of subject matter, it offers excellent resources and interactions with NASA scientists, and data for educators to bring the exciting context of space travel to the classroom.

**CURR 672 Math Connections to STEM Education 3 Credits**

The course introduces a wealth of applied mathematics exercises and activities relevant to integrated STEM assets and science activities. Some are in the realm of topics seen in Earth and Space science and physics. Live presenters break down authentic examples and projects, and demonstrate to educators how problems incorporate Common Core State Standards-based mathematics with applications that meet Next Generation Science Standards performance expectations. Educators survey math and science examples and tools as the course promotes the use of applied mathematics in science, or science in mathematics, to meet content goals in the classroom.

**CURR 673 NASA Astronomy and Space Science 3 Credits**

Harness your students' enthusiasm for space and astronomy by using astronomical images to enrich your physical, Earth, and life science courses. Measure the speed of an asteroid, learn about erosion on Mars, and see the tracers of life that are visible from space. In this course, we explore the many ways in which real data from NASA's space science and astronomy missions can be used to teach math and science content in your classroom, meeting science and math standards in Next Generation Science Standards and Common Core State Standards. Through the use of cutting-edge technology tools, and with a NASA scientist visiting our class, you will not only learn more about the universe, you will learn how to bring the universe into your education context.

**CURR 674 NASA Physics for Real Beginners: Earth, Moon, and Space 3 Credits**

Gain an introduction to physics in this conceptual course that uses NASA's space initiatives as the context for content. Learn about gravitation between celestial bodies, how to get a satellite into orbit, what it takes to blast off into space, and more. This course will discuss these and related topics while exploring NASA content related to space and the Hubble Space Telescope and Kepler Missions. Bring cutting-edge examples to your classroom while addressing Next Generation Science Standards performance expectations.

**CURR 675 Reading and Writing in the Science Classroom 3 Credits**

Discuss and analyze the ways that literacy and science connect in the science classroom, and highlight how reading and writing can be used to increase students' understanding of science content. Focus on how to integrate important literacy skills from Common Core State Standards in your science and STEM classroom to address content standards from Next Generation Science Standards. Cutting-edge strategies and well-founded principles pave the way to success with non-fiction reading material. The manner in which information and scientific content is presented shapes student success, not just for reading, but student writing, organization, and presentation.

**CURR 676 The E in STEM: Meaningful Content for Engineering 3 Credits**

Learn how to use engineering to make your classroom come alive. Bridge and teach math and science concepts through exciting applications in the Engineering Design Process where you and your students design, test, and evaluate models and real-life applications. Activities are hands-on and emphasize the reciprocities between science, technology, engineering, and mathematics in formal design challenges. Educators enrich classroom curriculum with elements of design in science, mathematics, or technology activities, addressing important Next Generation Science Standards' engineering design practices.

**CURR 677 WDLC - Weather Data Learning Center 3 Credits**

Use weather data to teach and learn math . This course teaches content in a math curriculum that uses weather data. Weather Data Learning Center demonstrates increases in student performance in grade 4 mathematics. Collect, access, and interpret current real-time imagery, maps and data. Make connections from weather to learn Common Core-based mathematics using various STEM pedagogical strategies. Learn the basics of clouds, air masses, humidity, fronts, pressure, jet stream, and climatic patterns as you apply these ideas to math concepts such as measurement, fractions, number sense, data collection, and analysis.

**CURR 678 Action Research in the STEM Classroom 3 Credits**

A Capstone Course requirement "option", this course may be part of joint Master's Degree programs, or Endeavor's "5-course" certificate program earning Research Distinction and an award.

**CURR 679 Practicum in STEM Leadership 3 Credits**

Share your knowledge of STEM teaching and learning with colleagues in your building, district, or region.

**CURR 680 STEM Leadership Seminar 3 Credits**

The course contains STEM pedagogical content knowledge, incorporating authentic data and using technology as a tool for learning. The course provides a springboard for cultivating problem solving skills, inspiring student research projects, and integrating STEM methods and essential principles addressed in new standards.