

# STEM EDUCATION

**Office:** 1380 Lawrence Street Center, 701

**Telephone:** 303-315-6300

**E-mail:** [academicservices@ucdenver.edu](mailto:academicservices@ucdenver.edu)

## Overview

The STEM Education program promotes elementary and secondary mathematics and science teachers' passion, confidence, and competence in providing mathematics and science teaching-learning processes informed by insightful theories, effective learning activities, and innovative teaching strategies, as well as by international perspectives. This program focuses on the integration of theory, research, and practice to enable teachers to make instructional decisions and implement mathematics and science lessons that promote students' conceptual understandings and problem solving, including opportunities for doing research.

## Programs

- Mathematics Education, MSED (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/mathematics-education-msed/>)
- STEM Education with a concentration in Mathematics Education, MA (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/stem-education-concentration-mathematics-education-ma/>)
- STEM Education with a concentration in Math and Science Education, MA (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/stem-education-concentration-math-science-education-ma/>)
- STEM Education with a concentration in Science Education, MA (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/stem-education-concentration-science-education-ma/>)
- Middle School Math Endorsement (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/middle-school-math-endorsement/>)
- Mathematical Content Knowledge for Teaching, Graduate Certificate (<http://catalog.ucdenver.edu/cu-denver/graduate/schools-colleges-departments/school-education-human-development/stem-education/mathematical-content-knowledge-teaching-graduate-certificate/>)

## Faculty

Information about faculty in this program is available online at: <https://education.ucdenver.edu/about-us/faculty-directory/-in-category/categories/sehd/program-areas/stem-education> (<https://education.ucdenver.edu/about-us/faculty-directory/-in-category/categories/sehd/program-areas/stem-education/>)

## Math Education (MTED)

MTED 5002 - Elementary Mathematics Teaching I (3 Credits)

Prepares elementary teachers to teach mathematics to PreK-6 students while applying principles of the National Council of Teachers of Mathematics to mathematical learning. Teachers explore ways to help all elementary students become flexible and resourceful mathematical problem solvers. Cross-listed with MTED 4002. Restriction: Restricted to students in the Teacher MA or undergraduates in the BAMA. Max hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: TCHR-MA plan or BMA subplan.

MTED 5003 - Elementary Mathematics Teaching II (3 Credits)

Develops the mathematical and pedagogical understandings and competence of elementary teachers, focusing on instructional assessment, principles, and practices. Cross-listed with MTED 4003.

Prereq: MTED 4002 or MTED 5002. Restriction: Restricted to students in the Teacher MA or undergraduates in the BAMA. Max hours: 3 Credits.

Grading Basis: Letter Grade

Prereq: MTED 5002 or MTED 4002. Restriction: TCHR-MA plan or BMA subplan.

MTED 5030 - Theories Of Mathematics Learning (3 Credits)

Develops educators' knowledge of foundational theories and conceptual frameworks in mathematics education. MTED 5030 and 7030 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5040 - Mathematics Teaching - Theory and Practice (3 Credits)

Develops educators' research-based understandings and practices of PreK-12 mathematics teaching and learning. MTED 5040 and 7040 are cross-listed. Repeatable. Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

MTED 5050 - Critique Of Mathematics Education Research (3 Credits)

Develops educators' understanding of various research studies in mathematics education, including research focusing on mathematics teaching and learning, attending to students' mathematical reasoning, and teaching mathematics for social justice and equity. Increases educators' competence, confidence and enthusiasm in critiquing research. MTED 5050 and 7050 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5060 - Developmental Pathways In Students' Mathematical Thinking (3 Credits)

Fosters educators' development of research-based ways of determining (a) what to look for, (b) how to look for, (c) how to synthesize and report on, and (d) how to incorporate in pedagogy data-grounded inferences about children's mathematical thinking. MTED 5060 and 7060 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5070 - (Re)Humanizing the Teaching and Learning of Mathematics (3 Credits)

Expands educators' conceptions of society's role in determining what counts as mathematics to be taught and learned. Develops understanding of historical and systemic marginalization in mathematics education. Increases abilities to address issues of privilege and oppression that impact students' opportunities. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5300 - Curriculum and Methods for Teaching Mathematics (3 Credits)

Fosters teachers' use of task-based mathematics pedagogy, including orchestrating students' mathematical discourse, to develop mathematics classrooms in which the teacher builds from students' current understandings, accommodates for students' differences, and has high expectations for all students. Cross-listed with MTED 4300. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5301 - Assessment and Equity in Mathematics Instruction (3 Credits)

Examines mathematics assessment and equity from both a teacher's and a student's perspective. Focuses on assessment as a process, during which a teacher gathers evidence of students' mathematical knowledge and understanding and then uses that evidence to make instructional decisions. Prereq: Concurrent enrollment in an internship or permission of instructor. Cross-listed with MTED 4301. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5400 - Mathematics for Elementary Teachers (3 Credits)

Key mathematical concepts for K-6 teachers informed by NCTM & Common Core State Standards, such as place-value number systems, rational, proportional, & algebraic reasoning, geometrical concepts, & statistical/probability ideas. Students' meaningful, enjoyable learning is promoted via problem solving activities. Cross-listed with MTED 3040. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5619 - Expanding Conceptions of Number: Quantity and Operation (3 Credits)

Teachers' learning will focus on quantities and operations in place value number systems, how students understand such systems, and how teaching may promote students' progress. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5620 - Developing Fractional & Proportional Reasoning (3 Credits)

Teachers' learning will focus on quantities and operations involved with ratio, fraction, and proportion; and on how students understand ratio, fraction and proportion; and how teaching may promote students' progress. Max hours: 3 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 3.

MTED 5621 - A World of (Different) Numbers: Quantity and Operation (3 Credits)

Develops K-12 teachers' understanding of number systems and the ability to foster students' understanding. Focuses on number, quantity, and operation. Applicable to teaching students at all grade levels in line with the K-12 Common Core Standards. Cross-listed with MTED 4621. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5622 - Expanding Conceptions of Algebra (3 Credits)

Develops K-12 teachers' understanding of algebra concepts and the ability to foster students' understanding. Focuses on equivalence, variable, covariation, and function. Applicable to teaching students at all grade levels in line with the K12 Common Core Standards. Cross-listed with MTED 4622. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5623 - Geometrical Ways Of Reasoning (3 Credits)

Develops K-12 teachers' geometrical reasoning and the ability to foster students' reasoning. Addresses transformation, measurement, classification, objects, imagery, formulas, and investigation. Applicable to teaching students at all grade levels in line with the K-12 Common Core Standards. Cross-listed with MTED 4623. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 5840 - Math Education Independent Study (1-6 Credits)

Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

MTED 7030 - Theories Of Mathematics Learning (3 Credits)

Develops educators' knowledge of foundational theories and conceptual frameworks in mathematics education. MTED 5030 and 7030 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 7040 - Mathematics Teaching - Theory and Practice (3 Credits)

Develops educators' research-based understandings and practices of PreK-12 mathematics teaching and learning. MTED 5040 and 7040 are cross-listed. Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

MTED 7050 - Critique Of Mathematics Education Research (3 Credits)

Develops educators' understanding of various research studies in mathematics education, including research focusing on mathematics teaching and learning, attending to students' mathematical reasoning, and teaching mathematics for social justice and equity. Increases educators' competence, confidence and enthusiasm in critiquing research. MTED 5050 and 7050 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 7060 - Developmental Pathways In Students' Mathematical Thinking (3 Credits)

Fosters educators' development of research-based ways of determining (a) what to look for, (b) how to look for, (c) how to synthesize and report on, and (d) how to incorporate in pedagogy data-grounded inferences about children's mathematical thinking. MTED 5060 and 7060 are cross-listed. Max hours: 3 Credits.

Grading Basis: Letter Grade

MTED 7840 - Math Education Independent Study (1-6 Credits)

Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

## Science Education (SCED)

SCED 5004 - Elementary Science Teaching (3 Credits)

This course explores issues in elementary school science learning and teaching. Teacher candidates will develop knowledge of the nature of science and science content, engage in scientific inquiry, work to identify student conceptions, and plan and enact science instruction. Cross-listed with SCED 4004. Restriction: Restricted to students in the Teacher MA or undergraduates in the BAMA. Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

Restriction: TCHR-MA plan or BMA subplan.

**SCED 5050 - Introduction to Science Teaching and Learning (2 Credits)**

Focus on conceptual development, conceptual change, collaborative learning, students' conceptions of various topics in science, practical issues encountered in facilitating learning, managing the classroom, formative and summative assessment, and differentiating instruction in a collaborative environment. Seminar for Learning Assistants. Student must be serving as a Learning Assistant in the CU Denver LA program. Max hours: 2 Credits.

Grading Basis: Letter Grade

**SCED 5340 - Equity & Culture in Science Education: Local/Global (3 Credits)**

This course examines literature in science education related to issues of culture and equity. Topics will be framed by an understanding of equity in diverse classrooms and how it informs research, curriculum and instruction. Cross-listed with SCED 4340 and ENVS 5340. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5350 - Issues and Trends in Science Education (3 Credits)**

Explores the current issues and trends in science education related to theory, pedagogy, practices, curriculum, and other contemporary topics. Cross-listed with SCED 4350. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5360 - Physics Teaching and Learning (3 Credits)**

In this course, we will explore how people learn physics, and how physics is and can be taught. We will read literature in physics, physics education research, education, psychology, and cognitive science and apply it to your physics teaching. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5365 - Physics Teaching as Research (3 Credits)**

In this course, you will research your teaching of physics, with the explicit goals of improving your teaching practice and improving student learning of physics. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5400 - Theory and Pedagogy of Science Learning (3 Credits)**

Examines current issues, strategies, materials, and technology related to the teaching and learning of science at the middle and secondary school levels. Science curriculum, teachers' pedagogical content knowledge, and research in science education are investigated. Cross-listed with SCED 4400. Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

**SCED 5401 - Inquiry Science Pedagogy and Practices (3 Credits)**

An in-depth study of inquiry science pedagogy and practices and how inquiry science supports standards-based education to make science accessible to ALL learners. The course provides a review of research on pedagogy and practices that support student understanding, problem solving and creativity through the use of inquiry science. Prereq: Concurrent enrollment in an internship or permission of instructor is required. Cross-listed with SCED 4401. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5416 - Math-Science Connections: Outdoor (3 Credits)**

(Primarily for pre-secondary teachers.) Explores science concepts through outdoor activities appropriate for middle-grade students. Topics include how the nature of science and mathematics informs pedagogy, national and state standards, earth science and paleontology, orienteering and map usage, water analysis, astronomy and entomology. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5500 - The Nature of Science (3 Credits)**

This course is a critical exploration of science and scientific knowledge using an epistemological approach to ask (and possibly answer) questions about sociological issues in science and implications for science research, teaching and learning. Cross-listed with SCED 7500. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5540 - Foundations of School Health Education (3 Credits)**

This course is an overview of the principles of behavior theory as they relate to health education in both theory and practice. The course will examine the characteristics of effective school-based health education programs. Issues of ethnicity, culture, and race as they relate to health will be examined throughout the course. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5550 - Curriculum Materials in Health Education (3 Credits)**

This course will support the application of behavior theory as it applies to specific health content knowledge and skills. Special attention will be given to the skills, instructional strategies, and techniques needed to develop a culturally responsive classroom to promote success for all learners. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5560 - Health Education Teaching Practices (3 Credits)**

The course provides an overview of health education teaching and learning strategies for use in school settings. Action research will be introduced and utilized as a method to examine current teaching practices. Role-play, student assessment development, differentiation of instruction, and culturally responsive classroom practices will be examined. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5650 - Environmental Education (3 Credits)**

This course links the theory and practice of environmental education to inform curricular development and pedagogical knowledge. Cross-listed with ENVS 4650 and ENVS 5650. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5660 - Energy Education (3 Credits)**

Explores current energy problems. Students examine such topics as fuels from plants, fuels from wastes, fossil fuels, nuclear energy, wind energy, geothermal energy, solar energy, and energy conservation. Includes demonstration of available educational resources for grades K-12. The purpose of the course is to make technical aspects of energy accessible to the lay person. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5670 - Experiential Learning In The Parks (3 Credits)**

This course guides students through their experiences in a summer field placement, using readings, discussions and other interactive tools that focus on place-based education. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5690 - Curriculum Development in Place-Based Education (3 Credits)**

Students in this course apply knowledge about place-based education in schools and communities for educational purposes. Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5780 - Storytelling (1-4 Credits)**

Explores the history, function, philosophy, and techniques of storytelling. This class also includes collecting, selecting, preparing, developing, and delivering stories. Research and resources are emphasized. Repeatable. Max Hours: 4 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 4.

**SCED 5800 - Curriculum Workshop for Science Teachers (0.5-4 Credits)**

Opportunity to work on curricular projects and problems in the schools.

Explore various formal and informal learning environments such as study groups and after-school activities. Prereq: 18 semester hours in education and teaching experience or permission of instructor.

Repeatable. Max Hours: 36 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 36.

**SCED 5840 - Independent Study (1-4 Credits)**

Repeatable. Max Hours: 9 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 9.

**SCED 5920 - Readings in Elementary Education (1-4 Credits)**

Max hours: 4 Credits.

Grading Basis: Letter Grade

**SCED 5930 - Internship in Secondary Education (3 Credits)**

Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 5950 - Master's Thesis (1-8 Credits)**

Repeatable. Max hours: 8 Credits.

Grading Basis: Letter Grade with IP

Repeatable. Max Credits: 8.

Additional Information: Report as Full Time.

**SCED 6110 - Science and Math Curriculum Studies (3 Credits)**

Students examine frameworks for curriculum design, discuss the psychological and philosophical foundations of curricula, and analyze the curriculum that they use in their own teaching. Students synthesize what teachers must do in order to effectively implement curricula. Prereq: Graduate student status. Cross-listed with SCED 7110. Max hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: Graduate level students

**SCED 6120 - International Perspectives on the Curriculum (3 Credits)**

Considers schooling patterns in the U.S., the U.K., Japan, Australia, and several European countries, examining different approaches to curriculum issues in relation to social, historical, and economic factors.

Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 6840 - Independent Study (1-4 Credits)**

Repeatable. Max Hours: 4 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 4.

**SCED 6950 - Master's Thesis (4 Credits)**

Max hours: 4 Credits.

Grading Basis: Letter Grade with IP

Additional Information: Report as Full Time.

**SCED 6990 - Special Topics (1-6 Credits)**

Repeatable. Max Hours: 6 Credits.

Grading Basis: Letter Grade

Repeatable. Max Credits: 6.

**SCED 7110 - Science Math Curriculum Study (3 Credits)**

Students examine frameworks for curriculum design, discuss the psychological and philosophical foundations of curricula, and analyze the curriculum that they use in their own teaching. Students synthesize what teachers must do in order to effectively implement curricula. Restriction: Graduate student status. Cross-listed with SCED 6110. Max hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: Graduate level students

**SCED 7500 - The Nature of Science (3 Credits)**

This course is a critical exploration of science and scientific knowledge using an epistemological approach to ask (and possibly answer) questions about sociological issues in science and implications for science research, teaching and learning. Cross-listed with SCED 5500.

Max hours: 3 Credits.

Grading Basis: Letter Grade

**SCED 7840 - Independent Study (1-3 Credits)**

Max hours: 3 Credits.

Grading Basis: Letter Grade

## Science, Technology, Engineering & Math Education (STME)

**STME 5001 - Planning for Learning in Mathematics and Science (3 Credits)**

This course explores aspects of complex curriculum and instructional concepts through the lens of mathematics and science educators. A focus will include: Socio-cultural learning theory in Math and Science; standards-based instruction; instructional design; formative & summative assessment, and differentiation so that meaningful instruction becomes accessible to all students. Cross-listed with STME 4001. Max hours: 3 Credits.

Grading Basis: Letter Grade

**STME 5051 - STEM Capstone: Secondary Education (3 Credits)**

This course provides Secondary STEM Education students with a capstone learning experience that integrates knowledge of STEM content, students, and school context into socially-just and culturally responsive practices. Cross-listed with STME 4051. Restriction: Restricted to students in the Teacher MA or undergraduates in the BAMA. Max hours: 3 Credits.

Grading Basis: Letter Grade

Restriction: TCHR-MA plan or BMA subplan.