

GRADUATE SCHOOL INTERDISCIPLINARY PROGRAM

Professional Master of Arts in Elementary Math, Science, and Technology Education

Kelly McConaughay,
Program coordinator

The Professional Master of Arts (PMA) degree program in Elementary Math, Science, and Technology Education is a professional master's degree for elementary (K-8) teachers. The program offers teachers learning experiences that will allow them to enhance their competence as teachers of mathematics, science, and technology. The program's goal is to prepare teachers who are leaders in Math, Science, and Technology Education who are committed to providing all students the best educational opportunities possible. Graduates of the program will be able to:

- demonstrate significant growth in their math and science content mastery
- integrate technologies as tools of math and science instruction
- design and implement inquiry-based approaches to instruction that respond to the needs of a diverse student population
- translate real-world events and phenomena into effective instructional practices
- use various forms of assessment to inform their work in the classroom
- exhibit the attributes of self-efficacy consistent with being a life-long learner related to being a math, science, and technology educator
- use research to inform practice
- provide service to the education community as a teacher leader.

Admission Requirements

Applicants must meet all entrance requirements of the Graduate School and hold current teacher certification. Students progress through the program as a cohort. A new cohort will begin no more than once per calendar year. Check with the Graduate School for the next cohort start date.

Degree Requirements

The program requires 33 hours of graduate-level courses to be completed in 33 months. Students are expected to successfully complete a STEM Education Project (MST 685) that integrates appropriate demonstrations of research and leadership skills and inquiry-based teaching and learning as part of the comprehensive assessment of their learning in the program.

Course of Study

Summer I

MST 600, 601, or 609 Science Through Inquiry	3
MST 610 Math Through Inquiry	3
MST 611 Directed Research in Science & Math Internship ...	1
MST 612 Introduction to Teacher Leadership	1
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	8

Fall I

Elective (chosen from approved list).....	3
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	3

Spring I

MST 650 Inquiry-based Curriculum: Development and Analysis	3
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	3

Summer II

MST 620, 621, or 629 Science Through Inquiry II	3
MST 660 Research in Math and Science.....	2
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	5

Fall II

MST 670 Action Research: Methods and Practice.....	3
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	3

Spring II

Elective (chosen from approved list).....	3
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	3

Summer III	
MST 680 Nature of Inquiry and Innovation.....	3
MST 681 Advanced Teacher Leadership.....	2
MST 685 STEM Education Project.....	1
	6
Fall III	
MST 685 STEM Education Project.....	2
	2
Total hours required	33

Electives

- MST 630 Teaching Science Using Robotic Platforms
- MST 631 The Science of Foods and Nutrition
- MST 632 The Science of Matter
- MST 633 Pharmacology and the Human Brain
- MST 634 Crime Scene Science
- MST 635 The Science of Global Climate Change
- MST 636 The Science of Computer Games
- MST 637 Scientific Myths and Misconceptions
- MST 639 Special Topics

Course Descriptions

MST 600 Investigative Math, Science, and Technology for Educators: Energy 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Introductory course of a two-courses sequence. Course content integrated along the theme of energy. Prerequisite: Graduate student standing; satisfactory score on pretest or suitable remediation.

MST 601 Investigative Math, Science, and Technology for Educators: Motion 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Introductory course of a two-course sequence. Course content is integrated along the theme of motion. Prerequisite: Graduate student standing; satisfactory score on pretest or suitable remediation.

MST 609 Investigative Math, Science, and Technology for Educators: Special Topics 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Introductory course of a two-course sequence. Course content is integrated along a major theme. Prerequisite: Graduate student standing; satisfactory score on pretest or suitable remediation.

MST 610 Math Through Inquiry 3 hrs.

Investigation of important ideas of mathematics and mathematical models. Topics include: classic problems, number patterns, infinity, topology, chaos, and fractals. Prerequisite: Graduate student standing; satisfactory score on pretest or suitable remediation.

MST 611 Directed Research in Science and Math

Internship 1 hr.

Students work with a faculty member from a STEM (science, technology, engineering, or math) discipline in a guided research internship. Prerequisite: Graduate student standing.

MST 612 Introduction to Teacher Leadership 1 hr.

Introduction to teacher leadership roles in contemporary schools through inter- and intra-personal leadership development. Prerequisite: Graduate student standing.

MST 620 Topics in Investigative Math, Science, and Technology for Educators II: Evolution 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Second course of a two-course sequence. Course content is integrated along the theme of evolution. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 621 Investigative Math, Science, and Technology for Educators II: Environmental Science 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Second course of a two-course sequence. Course content is integrated along the theme of environmental science. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 629 Investigative Math, Science, and Technology for Educators II: Special Topics 3 hrs.

Course integrating math, science, and technology in an investigative format. Emphasis on using scientific methods to explore thematic material. Course taught in an inquiry-based, investigative format that includes application to pre K-12 classrooms. Second course of a two-course sequence. Course content is integrated along a rotating theme. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 630 Teaching Science Using Robotics**Platforms 3 hrs.**

Robot building activities designed to teach key technology and science concepts. Addresses the concepts of programming, behaviors, systems, control, sensors, and feedback with an introduction to artificial intelligence as it relates to robotics, the impact of robotics technology on society, and futuristic trends. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 631 The Science of Foods and Nutrition 3 hrs.

Application of chemical and biological principles to food and nutrition. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 632 The Science of Matter 3 hrs.

Properties and selection of materials for engineering and medical applications. Developments and application of alloys, polymers, ceramics, and composite materials. Interactions with the environment. Recent advances in nanotechnology, and application of synthetic and natural materials in medicine. An inquiry-based course with numerous easy-to-perform workshops. Active participation of the students in developing workshops is aimed at enhancing leadership skills. Small team groups conduct research and develop workshops. Prerequisite: B or better in one course from MST 600-699, or graduate student standing and consent of instructor.

MST 633 Pharmacology and the Human Brain 3 hrs.

Drug use and abuse will be explored from psychological, biological, sociological, and clinical perspectives. Students will gain an understanding of the history of drug use and drug policy and will be encouraged to identify sociological factors that promote abuse and incarceration. Students will be introduced to basic pharmacological principles, gross brain anatomy, and the neurobiology of drug action. Theories of addiction and contemporary treatment paradigms will be explored. Includes laboratory component. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 634 Crime Scene Science 3 hrs.

Application of interdisciplinary, inquiry-based, fundamental scientific principles to solve simulated problems within the theme of forensic science. A lab component is included. Prerequisite: B or better in one course from MST 600-609 or graduate student standing and consent of instructor.

MST 635 The Science of Global Climate Change 3 hrs.

Focuses on the global climate change with particular attention to the global heat budget, its interactions with other factors such as greenhouse gasses and anthropogenic alterations to global systems. Instructors will cover basic at-

mospheric and terrestrial science (biology, geology, chemistry, physics, and mathematics) necessary to understand the problem. The consequences of global climate change on society (commerce, international relationships, policy, and national security) will then be discussed. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 636 The Science of Computer Games 3 hrs.

Computer gaming, its current uses, and societal impact will be comprehensively explored. Participants will learn rudimentary programming skills needed to develop a basic educational game, evaluate online gaming sites and stand-alone game boxes, review demographics of current gamers, identify the resources (software, hardware, and personnel) needed to create games and run online gaming sites. Participants will also evaluate the gaming industry and its business models for successful game development, become familiar with related computer laws and oversight committees from around the world, review current issues and concerns with games, and look at future gaming trends. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 637 Scientific Myths and Misconceptions 3 hrs.

Inquiry-based approach to investigating common myths or popular beliefs using principles of mathematics and sciences. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 639 Special Topics 3 hrs.

Inquiry-based approach to investigating science and mathematics content organized around a central theme. Topics will vary by instructor. Prerequisite: B or better in one course from MST 600-609, or graduate student standing and consent of instructor.

MST 650 Inquiry-based Curriculum: Development and Analysis 3 hrs.

Examination of the characteristics of inquiry-based curriculum. Application as a teacher leader to the analysis and modification of existing curricula using research-based qualities of curriculum design. Prerequisite: B or better in one course from MST 600-609.

MST 660 Research in Math and Science 2 hrs.

Students work with a faculty member from a STEM (science, technology, engineering, or math) discipline on a collaborative research project. Prerequisite: Graduate standing and B or better in MST 611.

MST 670 Action Research: Methods and Practice 3 hrs.

Focus on the methods of action research that lead to teachers answering questions about classroom practice with a goal of improving student performance. Prerequisite: Graduate standing.

MST 680 Nature of Inquiry and Innovation **3 hrs.**

Survey of innovations across the sciences and mathematics within a historical and cultural perspective. Comparison of modes of inquiry that lead to these innovations with processes of discovery used in the social sciences and the humanities. Prerequisite: B or better in MST 650.

MST 681 Advanced Teacher Leadership **2 hrs.**

Concepts of shared school leadership designed to develop leadership in teachers who continue to teach students but also have an influence extending beyond the classroom within the school and elsewhere. Prerequisite: B or better in MST 612.

MST 685 STEM Education Project **1-4 hrs.**

Capstone course to enhance STEM content knowledge while integrating concepts from inquiry-based teaching and learning, action research, and teacher leadership. Prerequisite: Graduate standing in an appropriate MPS program; grade of B or better in MST 660 and MST 670.