

# Mathematics and Science Education

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The Mathematics and Science Education Ph.D. is an interdisciplinary program requiring students to (1) develop substantial content mastery of mathematics and/or science; (2) demonstrate an understanding of educational theories, research methodologies, and best practices; and (3) conduct discipline-based educational research at the interface between the fields of mathematics or science and education. This program aims to produce college-level professors and researchers to perform, evaluate, and integrate the results of research in mathematics and science education. It also seeks approaches to improve the way K–16 science, technology, engineering, and mathematics (STEM) courses are taught.

The goals of this program are to prepare students to

- understand the field of mathematics and science education in terms of theory and practice, research, curriculum design, and student learning;
- conduct original research that generates new knowledge about the teaching and learning of mathematics and science; and,
- assume leadership roles in mathematics and science education, including teacher education, discipline-based research, and curriculum and instruction.

All students in the Mathematics and Science Education Ph.D. program will be expected to complete a minimum of two consecutive semesters of full-time study in residence at MTSU.

## Requirements for the Ph.D. in Mathematics and Science Education

Admission is based on a comprehensive assessment of a candidate's qualifications including Graduate Record Examination (GRE) scores, undergraduate and graduate grade point average, and letters of recommendation. Applicants must submit all application materials to the College of Graduate Studies. Candidate must

1. submit application and fee to the College of Graduate Studies.
2. submit official transcripts showing a grade point average (GPA) in previous academic work that indicates potential for success in advanced study. Successful applicants typically have a minimum 3.25 GPA in their most recent graduate work or a minimum 3.0 GPA when entering with a bachelor's degree. Applicants holding a master's degree

should have earned at least 24 semester hours of graduate mathematics, science, and/or education credit. Applicants holding only a bachelor's degree will be expected to have earned that degree in an area of mathematics or science and will be expected to earn a master's degree in science, mathematics, or education as they complete the requirements of the Ph.D. All applicants to this program will either possess a mathematics or science degree upon admission or will be required to earn a content master's as a part of their program of study.

3. submit official scores for the verbal, quantitative, and analytical writing measures of the GRE that indicate potential for success in the Mathematics and Science Education program. Although specific minimum scores are not set, evaluation of scores is an important factor in admission decisions.
4. provide letters of recommendation from at least three professors or professionals that address the applicant's potential to successfully complete a Ph.D. in Mathematics and Science Education.

International students must also meet the College of Graduate Studies requirement for proof of English language proficiency. This may be accomplished by submission of TOEFL, UMELI test, or IELTS scores that meet the college's requirements or by successful completion of level 112 of ELS coursework.

Applicants who do not meet these minimums but whose application materials indicate high potential for success may be admitted conditionally. Such students must meet the conditions of their admission in the time stated to remain in the program of study.

The application deadline is February 15 for those wishing to be considered for graduate assistantships for the following fall. Late applications may be considered, but financial support in the form of an assistantship is not guaranteed.

Once admitted to the program, candidates must complete at least 75 postbaccalaureate semester hours as follows. (Students entering with a master's degree in mathematics, education, or a science discipline may have up to 15 graduate hours of previous coursework applied after determination that the content of the courses is directly equivalent to existing courses in the Mathematics and Science Education curriculum.)

### Core Courses (30 hours)

		Teaching Internship
		Seminar in Mathematics and Science Education*
MSE	7840	Special Topics in Mathematics and Science Education*
PSY	7190	Advanced Cognitive Psychology
PSY	7280	Psychological Statistics: Regression
PSY	7290	Psychological Statistics: Anova
SPSE	7010	Educational Research Methodology
SPSE	7170	Learning Theories and the Educational Process
SPSE	7220	Advanced Educational Technology

\* Students are required to take these courses at least twice before candidacy.

**Concentration Core (18 hours)****Biological Education Concentration Core**

BIOL 6200 Speciation  
 BIOL 6330 Principles of Physiology  
 BIOL 6450 Advancements in Molecular Genetics  
 BIOL 6460 Conservation Biology  
 Teaching and Learning Biology

**Chemical Education Concentration Core (19 hours)**

CHEM 6100 Intermediate Organic Chemistry  
 CHEM 6230 Intermediate Analytical Chemistry  
 CHEM 6300 Intermediate Physical Chemistry  
 CHEM 6400 Intermediate Inorganic Chemistry  
 CHEM 6500 Biochemistry I  
 CHEM 7900 Teaching and Learning Chemistry

**Mathematics Education Concentration Core (18 hours)**

MATH 6120 Advanced Linear Algebra  
 MATH 6170 Sets and Logic  
 MATH 6190 Analysis I  
 MATH 6320 Mathematical Problem Solving  
 Teaching and Learning Mathematics  
 STAT 6602 Regression Analysis OR  
 STAT 6603 Nonparametric Statistics OR  
 STAT 6604 Experimental Design

**Interdisciplinary Science Education Concentration Core (18 hours)**

Students who choose this concentration must select at least 18 hours (in consultation with their major advisors and dissertation committee) from the courses listed in the three concentrations above or from the courses listed below. Students must take one of the following courses: BIOL 7900, CHEM 7900, MATH 7900, or MSE 7900.

Intermediate Life Science

MATH 6100 Mathematics for Teachers  
 MATH 6330 Algebra for Teachers  
 MATH 6340 Geometry for Teachers  
 MATH 6350 Probability and Statistics for Teachers  
 Teaching and Learning Math and Science  
 PSCI 6020 Investigations in Physical Science  
 Intermediate Physical Science  
 PSY 6480 Advanced Topics in Quantitative Psychology

PSY 6550 Structural Equation Modeling  
 PSY 7210 Advanced Psychometrics  
 PSY 7580 Multivariate Data Analysis

**Electives (14–15 hours)**

In consultation with his or her major advisor and dissertation committee, each student will choose 14–15 credit hours from courses in the College of Basic and Applied Sciences and the College of Education and Behavioral Science at the 6000 or 7000 level.

Students in the Biological Education, Chemical Education, and Mathematics Education concentrations should select their electives to ensure that they have completed at least 21 hours of coursework in their field of interest—21 hours with a BIOL rubric for the Biological Education concentration, 21 hours with a CHEM rubric for the Chemical Education concentration, and 21 hours with a MATH or STAT rubric for the Mathematics Education concentration.

**Dissertation (12 hours)**

MSE 7640 Dissertation Research

Students are also required to

1. make at least two research presentations at regional, national, or international meetings as the lead or coauthor;
2. be lead author or make significant contribution as coauthor of two articles published, in press, or under review in high quality, peer-reviewed journals;
3. in collaboration with an MTSU faculty member serving as principal investigator, make a significant contribution to the development of at least one external grant proposal; and
4. complete the MSE 7800 Teaching Internship in a K–12 setting if they lack K–12 teaching experience.

**Courses in Mathematics and Science Education [MSE]**

**7840 Special Topics in Mathematics and Science Education.** Two credits. Required of graduate students specializing in Mathematics and Science Education. May be repeated.

