

MATHEMATICS AND SCIENCE EDUC (MSED)

MSED 500

Analysis of Classrooms II (Practicum and Seminar)

This course includes a two-hour seminar on campus each week along with approximately five hours per week in an area school. This is an introductory course that provides students background learning theory, classroom management, aspects of effective teaching, critical classroom variables, and the school as a system.

Lecture: 3 Lab: 0 Credits: 3

MSED 501

Advanced Strategies: Mathematics

A course that provides additional exposure and development of instructional strategies and models of mathematics teaching. Special emphasis is placed upon promoting critical thinking and decision making.

Lecture: 3 Lab: 0 Credits: 3

MSED 502

Advanced Strategies: Science

A course that provides additional exposure and development of instructional strategies and models of science teaching. Special emphasis is placed upon promoting critical thinking and decision making.

Lecture: 3 Lab: 0 Credits: 3

MSED 509

Instructional Strategies for Middle School Mathematics

This course addresses concerns of teaching grades 5 through 8 math by considering the social and psychological characteristics of students in transition from elementary to high school mathematics. The course uses a focus on rational number and reasoning (topics that span middle school curriculum) to study students' development of powerful representational systems and conceptual flexibility. Participants will learn about building mathematical community in which students construct mathematical evidence for claims of perceived regularities and patterns on logical reasoning and mathematical thinking. Participants will select, adapt, and design math tasks to serve instructional purposes and will learn what it means to build an ongoing assessment system that integrates self, peer, teacher, and formative/summative assessment into best practice.

Lecture: 3 Lab: 0 Credits: 3

MSED 510

Problem Based Algebra

Algebra is taught via a problem solving approach with connections to other topic areas such as geometry, statistics and probability. Explorations with and conjecturing about number relationships and functions provide experiences from which students develop algebraic habits of mind: Doing and undoing (algebraic thinking that involves reflective or reverse algebraic reasoning, doing problems and organizing data to representation situations in which input is related to output by well-defined functional rules); and abstracting from computation (developing the capacity to think about computations independently of particular numbers used). Instructor permission required.

Lecture: 3 Lab: 0 Credits: 3

MSED 511

Problem Based Number Theory

Number theory is taught via a problem solving approach with connections to geometry, logic, and probability. Explorations with and conjecturing about number patterns provide experiences from which students study various topics including the following: factors, primes, and prime factorization; counting techniques; greatest common factor (GCF) and least common multiple (LCM); divisibility; number patterns (e.g., Pascal's triangle, polygonal numbers, Pythagorean triples, Fibonacci numbers); Diophantine equations; remainder classes and modular arithmetic; iteration, recursion, and mathematical induction. Basic algebra and instructor permission required.

Lecture: 3 Lab: 0 Credits: 3

MSED 512

Philosophy of Science: Key Topics and Applications to K-12 Science Education

This course presents fundamental topics and key issues from philosophy of science (e.g., explanation, representation/models, evidence, laws and causation, confirmation/inductive logic, etc.). The goal of the course is to enrich teachers' understanding of philosophy of science so that they will be better prepared to design instructions both about science content and about NOS and NOSI. To achieve this, each course is explicitly linked to particular subject matter and concepts and/or NOS or NOSI ideas. Teachers will be facilitated to see why and how philosophy of science can inform science instruction.

Lecture: 3 Lab: 0 Credits: 3

MSED 513

Problem Based Statistics and Probability

This course emphasizes statistics and probability as practical subjects devoted to obtaining and processing data with a view toward making statements that often extend beyond the data. These statements (i.e., inferences) take the form of estimates, confidence intervals, significance tests, etc. The content of this course is concerned with the production of good data, and involves consideration of experimental designs and sample surveys. The activities have their origin in real data and are concerned with processing the data in the widest contexts and with a wide variety of applications such as social, administrative, medical, the physical sciences and the biological sciences. Basic Algebra and Instructor permission required.

Lecture: 3 Lab: 0 Credits: 3

MSED 514

Problem-Based Geometry

Geometry is taught via problem solving with connections to other topic areas such as algebra and number theory. Explorations of and conjecturing about fundamental concepts of Euclidean geometry in two and three dimensions and their application provide experiences from which students study various topics including the following: properties and relationships of geometric objects; geometric proof; area and volume; transformations, symmetry, and tessellations; trigonometric ratios; and visual modeling of algebraic operations as well as algebraic abstract concepts.

Lecture: 3 Lab: 0 Credits: 3

MSED 517**Problem-Based Calculus**

This course is focused on the development of foundational ideas, concepts, and methods of introductory calculus and its basic applications with emphasis on various problem-solving strategies, visualization, mathematical modeling, and connections to algebra, geometry, number theory, and logic relevant to the middle school mathematics curriculum. Explorations with the SimCalc software and conjecturing about linking graphs, tables, and concrete to represent dynamic situations provide experiences from which students study various topics including the following: linear, quadratic, cubic, exponential, logarithmic, and trigonometric functions and their graphs; limits and continuity; rate of change, slope, tangent, and derivative; area under a curve and integration; and elements of infinite series.

Prerequisite(s): MSED 510 with min. grade of C and (MSED 514 with min. grade of C or MSED 320 with min. grade of C or MSED 520 with min. grade of C)

Lecture: 3 Lab: 0 Credits: 3

MSED 518**History of Science: Key Episodes, Topics, and Applications to K-12 Science Education**

This course presents fundamental topics and key issues from history of science (the organization of science, science and religion, science and technology, scientific revolutions, etc.). The goal of the course is to enrich teachers' understanding of history of science so that they will be better prepared to design instructions both about science content and about NOS and NOSI. To achieve this, each course is explicitly linked to particular subject matter and concepts and/or NOS or NOSI ideas. Teachers will be facilitated to see why and how history of science can inform science instruction.

Lecture: 3 Lab: 0 Credits: 3

MSED 520**Geometry**

The course is focused on selected topics related to fundamental ideas and methods of Euclidean geometry, non-Euclidean geometry, and differential geometry in two and three dimensions and their applications with emphasis on various problem-solving strategies, geometric proof, visualization, and interrelation of different areas of mathematics. Permission of the instructor is required.

Lecture: 3 Lab: 0 Credits: 3

MSED 521**Perspectives in Analysis**

This course is focused on selected topics related to fundamental concepts and methods of classic analysis and their applications with emphasis on various problem-solving strategies, visualization, mathematical modeling, and interrelation of different areas of mathematics. Instructor permission required.

Lecture: 3 Lab: 0 Credits: 3

MSED 524**Get Energized -- Physical Science**

Get Energized is designed to help teachers become more proficient in key physical science concepts related to energy. Teachers can increase their comfort level in teaching energy related topics such as light, mechanical, heat, sound, and electrical. Each full-day workshop focuses on a particular energy topic and explores how that topic can be brought back to the classroom in an engaging way. This program also explores how to further the interaction of inquiry-based teaching methods into the classroom as well as the multiple ways that an informal institution can be used to further the curriculum objectives established. Major topics include energy transformation, potential and kinetic energy, mechanical energy, electrical energy, sound, and thermal. The course meets during the academic year, six sessions, 8:00 a.m. to 3:00 p.m.

Lecture: 3 Lab: 3 Credits: 3

MSED 530**Teacher Education/Professional Development in Science**

A course that stresses the empirical research on best practices in teacher education and professional development in science.

Lecture: 3 Lab: 0 Credits: 3

MSED 531**Teacher Education/Professional Development in Mathematics**

A course that stresses the empirical research on best practices in teacher education and professional development in mathematics.

Lecture: 3 Lab: 0 Credits: 3

MSED 538**Inquiry and Problem Solving**

A group of authentic inquiry experiences supervised by practicing scientists or mathematicians.

Lecture: 3 Lab: 0 Credits: 3

MSED 540**Informal Education Practicum**

Placement in an informal educational setting such as museums and outdoor education. The focus of this course is on the use of informal setting to supplement classroom instruction.

Lecture: 2 Lab: 5 Credits: 3

MSED 545**Statistics for Educators I**

Part one of a two-part course. The course provides concepts and methods of gathering, describing and drawing conclusions from data. Statistical reasoning, probability, sampling, regression, correlation, forecasting, nonparametric statistics, conceptions and misconceptions about statistics, problem solving techniques and current research are included throughout the course.

Lecture: 3 Lab: 0 Credits: 3

MSED 546**Statistics for Educators II**

Part two of a two-part course. Statistical reasoning, probability, sampling, regression, correlation, forecasting, nonparametric statistics, conceptions and misconceptions about statistics, problem solving techniques and current research are included throughout the course.

Lecture: 3 Lab: 0 Credits: 3

MSED 550**Clinical Supervision in Science/Mathematics**

Provides for the development of a variety of classroom observation techniques and clinical supervision skills.

Lecture: 3 Lab: 0 Credits: 3

MSED 552**Assessment and Evaluation**

Contemporary assessment and evaluation theory and the development of valid cognitive, affective, and psychomotor assessment items/tasks. In-depth attention is given to the development and scoring of alternative assessment techniques such as portfolios and projects.

Lecture: 3 Lab: 0 Credits: 3

MSED 554**Middle and Secondary Level Science Curriculum**

This course will develop a functional understanding of various factors that influence the development and direction of middle and secondary science curricula. Students will become familiar with strategies to integrate language arts, reading, and writing in the content area of science. Students will apply knowledge of subject matter, curriculum development, and curriculum theory to construct a hypothetical curriculum. Current trends, history of these trends, and rationales for science curriculum reform will be examined.

Lecture: 3 Lab: 0 Credits: 3

MSED 555**Middle and Secondary Level Mathematics Curriculum**

This course will develop a functional understanding of various factors that influence the development and direction of middle and secondary mathematics curricula. Students will become familiar with strategies to integrate language arts, reading, and writing in the content area of mathematics. Students will apply knowledge of subject matter, curriculum development, and curriculum theory to construct a hypothetical curriculum. Current trends, history of these trends, and rationales for mathematics curriculum reform will be examined.

Lecture: 3 Lab: 0 Credits: 3

MSED 562**Action Research I**

Reviewing, designing, and conducting research studies within the context of the students' own teaching.

Credit: Variable

MSED 563**Action Research II**

Reviewing, designing, and conducting research studies within the context of the students' own teaching. This course is a continuation of MSED 562.

Lecture: 0 Lab: 3 Credits: 3

MSED 564**Action Research III**

Reviewing, designing, and conducting research studies within the context of the students' own teaching. This course is a continuation of MSED 562 and MSED 563.

Lecture: 0 Lab: 3 Credits: 3

MSED 580**Adolescent Psychology**

This course is designed to develop the participants' understanding of adolescent psychology. The main foci throughout the course are the unique aspects of adolescents and how those aspects influence behavior, learning, and social interactions, especially with regard to middle schools. Studies will include educational psychology theories and models, motivation and learning, developmental changes during adolescence, cognitive abilities, human ecology, diversity, and cultures. Additionally, participants will examine historical and philosophical perspectives of adolescent psychology and synthesize how these perspectives have influenced teaching, learning, and cultures in middle schools. The course will involve weekly readings and reflections, classroom experiences, short assignments, tests/quizzes, research projects, and formal class presentations. Requires admission into the secondary mathematics teacher certification program or instructor permission.

Lecture: 3 Lab: 0 Credits: 3

MSED 591**Research and Thesis M.S.**

A course that provides the guidance and opportunity for authentic research projects in Science or Mathematics Education to fulfill thesis requirements for MS Candidates.

Credit: Variable

MSED 594**Special Projects**

Advanced projects involving independent study, and especially fieldwork and modeling projects. (Variable: 1-6)

Credit: Variable

MSED 597**Special Problems**

Current problems in science/mathematics education. May be repeated for credit with different topics.

Credit: Variable

MSED 598**Methods of College Teaching in Mathematics and Science**

The course is designed to allow each student to develop the theoretical background, practical knowledge, and skills for successful college level mathematics or science teaching. Specific emphasis will be placed upon instructional methods/models, curriculum development, and instructional planning.

Lecture: 3 Lab: 0 Credits: 3

MSED 599**College Teaching Practicum**

The purpose of the course is to enhance college level teacher preparation with an advanced learning experience joining together theory and practice. This course provides the student the opportunity to practice and improve knowledge and skills at teaching. The student may actively participate or act as an observer at a different college. In addition, students are required to prepare a Portfolio. The Portfolio provides the student an opportunity to demonstrate a readiness for teaching that describes their efforts and progress in preparing to teach science or mathematics at the college level.

Lecture: 3 Lab: 0 Credits: 3

MSED 601

Critical Analysis in Quantitative Research

A study of quantitative research designs and analytical procedures with critical analysis of perspectives of research in science/mathematics education.

Lecture: 3 Lab: 0 Credits: 3

MSED 602

Quantitative Research Design and Practicum

A study of quantitative research designs, analytical procedures, and in-depth analysis with specific applications in science/mathematics education.

Lecture: 3 Lab: 0 Credits: 3

MSED 603

Critical Analysis in Qualitative Research

A study of qualitative research designs and analytical procedures with critical analysis of perspectives of research in science/mathematics education.

Lecture: 3 Lab: 0 Credits: 3

MSED 604

Qualitative Research Design and Practicum

A study of qualitative research designs, analytical procedures, and in-depth analysis with specific applications in science/mathematics education.

Lecture: 3 Lab: 0 Credits: 3

MSED 691

Ph.D. Thesis Research

A course that provides the guidance and opportunity for authentic research projects in Science or Mathematics Education to fulfill thesis requirements for PhD Candidates. Instructor permission required.

Credit: Variable