

Integrated Science

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Director

Integrated Science for Middle School

The Master of Arts in Integrated Science program is designed for those teachers who seek to deepen their content understanding in the natural sciences in order to confidently address the Ohio Science Content Standards. Current state requirements and federal legislation make it imperative that teachers of science in the middle grades be adequately trained in a broad range of the natural sciences. This cooperative effort of the departments of Biology, Chemistry, and Physics along with the assistance of the Department of Education and Allied Studies will provide the student with a depth of content knowledge and the pedagogical skills necessary to meet the educational needs of the middle-grade student.

This program is open to all certificated/licensed teachers who currently teach in the middle grades or are interested in teaching science at the middle grade level. New cohorts will begin each fall. The program consists of ten courses offered in a two-year cycle.

Admission Requirements

Criteria for full acceptance into the Master of Arts in Integrated Science include:

- Completed Application for Graduate Studies
- A baccalaureate degree from an accredited institution
- Submission of official transcripts
- An undergraduate GPA of at least 2.5
- Verification of a valid teaching certificate/license

General Degree Requirements

Students participate in the Master of Arts in Integrated Science as part of a cohort of approximately twenty (20) students. The program consists of 34 credit hours, including a three-credit integrated research course (see SI 590 below). The program takes two years to complete and begins in the fall semester. Students take one course during the fall and spring semesters and three courses during each of two summers. The student is expected to maintain a 3.0 or better grade point average. Students will develop, write and present a completed action research project that is accepted by the program director and approved by the Office of Graduate Studies in order to graduate and be awarded a degree. The action research project presentation will contain an oral questioning component.

For teachers holding a State of Ohio Pre-K through grade 3 license or a grades 1-8 certificate, and who are interested in pursuing a Middle Childhood (grades 4-9) License in Science, additional coursework in Education may be required. An evaluation of transcripts by the Department of Education and Allied Studies can be conducted at the time of application.

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Course requirements: 34 Hours

- SI 500 How Do We Know What We Know?
- SI 510 Astronomy
- SI 520 Physical Science and Lab
- SI 530 Culturally and Developmentally Responsive Science
- SI 540 Earth Science and Lab
- SI 550 Life Science and Lab
- SI 560 Science and Technology
- SI 570 Ecology and Lab
- SI 580 Assessment in Interdisciplinary Science
- SI 590 Action Research and Lab

COURSE DESCRIPTIONS

500. HOW DO WE KNOW WHAT WE KNOW? 3 cr. Focuses on three main topics, the history of science, the philosophy of science, and exploratory data analysis techniques appropriate for use in the middle grades. The unifying theme is: “How can knowledge of science history, philosophy and data analysis techniques be used to produce high-quality instruction in the classroom?”

510. ASTRONOMY 3 cr. Covers proofs and observational results of Earth and Moon motions, historical changes in thinking about the organization of bodies in the universe, the origin and organization of the solar system, stellar evolution of low and high mass stars, and cosmology. Students are required to attend a class planetarium lesson, complete several computer activities, and carry out two small projects. Responses to online (Blackboard) questions also are required.

520. PHYSICAL SCIENCE 3 cr. Presents an introductory but substantial introduction to the fundamental behavior of matter and energy. It develops an understanding of and an appreciation for the fundamental concepts of physics and chemistry. Successful students will be able to extend this knowledge to help their students meet Middle School Science Standards.

520L. PHYSICAL SCIENCE LAB 1 cr. A hands-on laboratory course that presents opportunities for students observe, record, and analyze data that demonstrate concepts developed in the accompanying course. Many of the experiments performed in this course may be used with Middle School students to help them develop an understanding and appreciation of the fundamental concepts of physics and chemistry via experiential learning.

530. CULTURALLY AND DEVELOPMENTALLY RESPONSIVE SCIENCE 3 cr.
Compares physical, emotional, social and intellectual characteristics of academic grade levels, specifically middle school. Attention is given to relationships among aspects of development and between development and school learning. Common misconceptions concerning teaching of different academic levels, social and cultural differences will be identified and discussed. Science lessons will be designed that integrate strategies for all

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learning styles and exceptionalities. Four knowledge bases comprise this model: inquiry, partnership, contextualism, pedagogy and professionalism.

540. EARTH SCIENCE 3 cr. Earth processes. The State Science Standards as they apply to physical and historical geology, rocks and minerals, weathering, cycling of materials, and the forces that shape and change the Earth.

540L. EARTH SCIENCE LAB 1 cr.

550. LIFE SCIENCE 3 cr. Uses the Ohio Content Standards in Life Science as a guide to provide a broad base of background information in the biological sciences. Lecture and laboratory activities will be utilized to deepen the students' awareness and understanding of the central themes of biology.

550L. LIFE SCIENCE LAB 1 cr.

560. SCIENCE AND TECHNOLOGY 3 cr. Application of technology to the scientific enterprise, as well as instructional and learning outcomes. The course emphasizes the use of current technology as a practical tool in the middle school science classroom. Applications of technology to classroom instruction, communication, collection and analysis of data are specifically addressed.

570. ECOLOGY 3 cr. Integrates the various disciplines within science by investigating the relationships between living organisms and the environment. Laboratory work and field experience will be a central theme.

570L. ECOLOGY LAB 1 cr.

580. ASSESSMENT AND INTERDISCIPLINARY SCIENCE 3 cr. Focuses on formal and informal assessment strategies to ensure the growth of learners. Students will learn to design effective objective tests, gather assessment resources, evaluate their teaching practices, create rubrics and scoring guides, as well as assessing student attitudes about science and their learning environment. Multiple methods to gather information will be applied. Science lessons will be designed that integrate strategies for all learning styles and exceptionalities. Five knowledge bases comprise this model: inquiry, partnership, contextualism, pedagogy and professionalism.

590. ACTION RESEARCH 2 cr. Unifying element of the program. This portion of the course is devoted to the basic principles of Action Research. After exposure to these basic principles each student will be required to identify a specific question related to their practice as a teacher of science in the middle grades. This question will then serve as a mechanism to put the scientific method into practice. The teacher will research the literature on the selected topic, design and carry out a plan to answer the selected question. The process will result in a written Action Research Project. The completed

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project will be presented to a group of faculty and peers. The presentation will consist of an oral questioning component.

590L. ACTION RESEARCH PROJECT 1 cr. A credit that is awarded to the student upon successful completion and presentation of the Action Research Project.

595. INDEPENDENT STUDY 1-3 cr. A carefully designed reading and/or research project carried out under the supervision of a faculty member. Permission of the director is required for this course to count towards the degree.