

Proposal for a Masters of Arts in Integrated Science for Teachers

Introduction and Rationale

The purpose of the program is to provide middle school teachers of science with content material and pedagogical models in the various disciplines of the natural sciences. Current State requirements and the implementation of federal NCLB legislation, make it imperative that the teachers in the Middle grades be prepared to meet the educational challenges that lay ahead. 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 background and the pedagogical skills necessary to meet the new challenges.

II. Documentation of Needs and Results

The initial target population is the teachers of Middle School Science in the Cleveland Municipal School District (CMSD). According to CMSD, of 420 teachers of middle school science, only 62 (15%) “have some certification in science subject matter” (*Cleveland Municipal School District Math and Science Strategic Plan, page 14*). The report also states that 41% of the 9th graders taking March 2001 administration of the Ohio Proficiency Test were able to pass. Data presented in the August 20th issue of the Cleveland Plain Dealer indicates that the percent of students passing the 2002-03 administration of the OPT was 54%. Although progress was made, the scores still fell well short of the 85% passage rate expected by the State. Assuming the teachers of middle school science in other districts surrounding Cleveland reflect similar numbers, the population of teachers in need of the program would be quite large.

III. Program Goals

The goals of the *Masters of Arts in Integrated Science* are to:

1. provide the student with a depth of content information in the sciences.
2. increase, through the use of best practice models, the student’s pedagogical skills.
3. foster a network of academic and educational professionals who will act as a support group for the continued professional growth of the student.
4. enable the student to make the conceptual connections within and across science, mathematics, and other disciplines.

IV. Degree Requirements

To qualify for the master’s program in Integrated Science, as a matriculated student, the applicant must hold, minimally, a baccalaureate degree from an accredited college, have a 2.5 cumulative grade point average (based on a four–point system), complete the Graduate School Application, and submit two letters of recommendation. Additionally, the student must have a current teaching certificate for the State of Ohio.

Conditional admission may be granted to applicants whose undergraduate records are below the 2.5 minimum. In such instances, The Graduate School considers the applicant’s accomplishment in the junior and senior years of undergraduate study, particularly in the major; performance on standardized tests; recommendations; and professional or occupational experience or achievement. The applicant may also be required to complete additional course work or other remediation as a condition for acceptance.

Course requirements

- 34 Hours –31 plus 3 hours resulting in an “action research” project (see course description)
- SI 500- How Do We Know What We Know? (3 credit)
- SI 510- Astronomy (3 credit)
- SI 520- Physical Science (4 credit)
- SI 530- Culturally and Developmentally Responsive Science (3 credit)

SI 540- Earth Science (4 credit)
SI 550- Life Science (4 credit)
SI 560- Science and Technology (3 credit)
SI 570- Ecology (4 credit)
SI 580- Assessment in Interdisciplinary Science (3 credit)
SI 590- Action Research (3 credit)

Graduation requirements

At the time of acceptance, each student will be assigned to an advisor. Since the courses and course order are pre determined, the primary function of the advisor will be to monitor the student's progress through the program. The student is expected to maintain a 3.0 or better grade point average and present a completed action research project in order to graduate and be awarded a degree. The action research project will be presented before a review committee and will contain an oral questioning component.

V. Faculty

Instructors will be drawn from the tenured, tenure track, and visiting faculties of the Department of Biology, the Department of Chemistry, the Department of Physics, the Department of Education and Allied Studies and/or other departments within the University as scheduling and course offerings require. Part-time or adjunct faculty may be used in situations where full time faculty members are unavailable. In some instances individuals from outside the JCU faculty may be utilized in specific roles within a course. (The Cleveland Museum of Natural History may provide instructors and/or facilities to assist in teaching a course in Astronomy, for example).

VI. Program Review Committee

A Program Review Committee made up of representatives from the Graduate School, the departments of natural science, and the Department of Education and Allied Studies will meet periodically (at least once per year). The purpose of these meetings will be to review the progress of the program and to make suggestions for the improvement of the program. Assessment of the project may include but not necessarily be limited to student evaluations of courses, instructor evaluation of course, and evaluations from outside sources (i.e. CMSD or NSF evaluation instruments).

VII. Program Governance

~~The Scientist-Educator for the Math Science Partnership
Advisory Committee: a committee of faculty members from the departments involved in the Math
Science Partnership program along with a representative from The Graduate School.~~

The program will be governed by a committee of faculty members from the departments involved in the Math Science Partnership program, along with a representative of the Graduate School, and the Scientist-Educator for the MSP as the committee chair.

Course Descriptions

SI 500 - How Do We Know What We Know? (3 credits)

This course examines 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 will be; “How can a knowledge of science history, philosophy and data analysis techniques be used to produce high-quality instruction in the classroom?”

SI 510 – Astronomy (3 credits)

The historical development of the understanding of the universe; the tools and techniques used to understand the universe. Topics will include Sun as a star, stellar origin and evolution, galaxies and the Universe, and the solar system as known through space exploration.

SI 520 – Physical Science (3 credits)

This course is designed to cover the major physical science concepts found in the Ohio Department of Education and the Cleveland Municipal School District Science Standards for grades 6-8. As this is a graduate level course the material will be covered in greater depth. The coverage of the material will integrate research based pedagogical practice and approaches.

SI 520L- Physical Science Lab (1 credit)

SI 530 - Culturally and Developmentally Responsive Science (3credits)

This course will compare physical, emotional, social, and intellectual characteristics of academic grade levels. Common misconceptions concerning teaching of different academic levels will be identified and discussed. Science lessons will be designed that integrate strategies for all learning styles and exceptionalities.

SI 540 – Earth Science (3 credits)

This course will familiarize the student with earth processes. The major topics will reflect the State Science Standards as they apply to physical and historical geology, rocks and minerals, weathering, weather, cycling of materials, and the forces that shape and change the Earth.

SI 540L- Earth Science Lab (1 credit)

SI 550 – Life Science (3 credits)

This course is designed to provide basic background information in life sciences. This course will also provide skills and a knowledge base that can be taken into the classroom. It will include a laboratory component designed to increase instructor’s comfort level with the materials as well as providing a starting point for developing laboratory exercises that reinforce and supplement classroom instruction.

SI 550L- Life Science Lab (1 credit)

SI 560 – Science and Technology (3 credits)

The application of scientific and educational technology applied to instructional outcomes, teaching methodology, classroom practices, applied learning theory and the specific uses of technology tools for learning outcomes.

SI 570 – Ecology (3 credits)

This course will integrate the various disciplines within science. The outcome will be to demonstrate that when considering living systems, all aspects of scientific endeavor (chemistry, physics, and biology) usually come into play. The laboratory and field experience will be a central theme.

SI 570L- Ecology Lab (1credit)

SI 580 – Assessment and Interdisciplinary Science (3 credits)

This course will explain formal and informal assessment strategies to ensure the growth of the learners. The students will learn to design effective objective tests. Multiple methods to gather information and information about student learning based on student needs and the goals of instruction will be identified and discussed.

SI 590 – Action Research Essay (3 credits)

This course will serve as the unifying element of the program. The students, as individuals or as collaborative or cooperative groups will identify a specific scientific concept for investigation. The concept will be directly related to State or District Standards. The student(s) will research the concept, develop a lesson to effectively teach the concept, teach the concept, write a report (with supporting data), and present the report.

Appendix A: Baseline data from Cleveland Municipal School District Math Science Partnership Strategic Plan (page 14)

March 2001 6th Grade OPT	Over All	African American	Hispanic	White	Male	Female
Math						
District	24%	19%	22%	39%	21%	26%
State	61%	26%	41%	68%	61%	61%
Science						
District	22%	17%	21%	37%	21%	22%
State	61%	24%	38%	68%	62%	59%

March 2001 9th Grade OPT	Over All	African American	Hispanic	White	Male	Female
Math						
District	34%	29%	32%	51%	37%	30%
State	83%	38%	48%	79%	75%	70%
Science						
District	41%	37%	36%	60%	44%	39%
State	88%	46%	54%	85%	80%	76%

'00-'01 9th Graders	Attempted Algebra 1 or Integrated Math 1	Successfully Completed Algebra 1 or Integrated Math 1	Attempted Biology, Chemistry or Physics	Successfully Completed Biology, Chemistry or Physics
5,737	1,434	932	2,237	1,664
	25%	16%	39%	29%

Subject	Number of Teachers	Having Some Form of Certification in Subject Matter	Percent
MS Math	454	43	9.5%
MS Science	420	62	15%
HS Math	264	129	49%
HS Science	179	219	

