WINONA STATE UNIVERSITY
PROPOSAL FOR NEW COURSES

Department _____Geoscience/Science Education_______________________ Date __15 March 2004______________

Course No. __SCIE 401________________________________
Course Name Investigative Science III: Scientific Investigation of Your Community
Credits __4_____________________

This proposal is for a(n) __XX__ Undergraduate Course ______ Graduate Course

Applies to: ______ Major ______ Minor _____ Required _______ University Studies* 
____ Required ______ Elective

Prerequisites ___SCIE 201; EDUC 335; admission to Teacher Education program___________________________

Grading method __XX__ Grade only ______ P/NC only ______ Grade and P/NC Option

Frequency of offering __yearly____________

*For University Studies Program course approval, the form Proposal for University Studies Courses must also be completed. submitted according to the instructions on that form.

Provide the following information (attach materials to this proposal):

A. Course Description
   1. Catalog description.
   2. Course outline of the major topics and subtopics (minimum of two-level outline).
   3. Basic instructional plan and methods.
   4. Course requirements (papers, lab work, projects, etc.) and means of evaluation.
   5. Course materials (textbook(s), articles, etc.).
   6. List of references.

B. Rationale
   1. Statement of the major focus and objectives of the course.
   2. Specify how this new course contributes to the departmental curriculum.
   3. Indicate any course(s) which may be dropped if this course is approved.

C. Impact of this Course on other Departments, Programs, Majors, or Minors
   1. Does this course increase or decrease the total credits required by a major or minor of any other department? If so, which department(s)?
   2. List the departments, if any, which have been consulted about this proposal.

D. University Studies Course Proposals
   The form Proposal for University Studies Course must also be completed and submitted according to the instructions on that form.

Attach a Financial and Staffing Data Sheet.

Attach an Approval Form.

Department Contact Person for this Proposal:

____Cathy Summa _______________________  ________X5269__ ___csumma@winona.edu____
Include a Financial and Staffing Data Sheet with any proposal for a new course, new program, or revised program.

Please answer the following questions completely. Provide supporting data.

1. Would this course or program be taught with existing staff or with new or additional staff? If this course would be taught by adjunct faculty, include a rationale.

This course will be taught by existing staff. During Fall 2004, the first time the course is offered, staffing is secured by grant money obtained specifically to support the development and pilot offering of this course. In future semesters, this course will be offered by existing staff who will teach fewer sections of other University Studies natural science courses.

2. What impact would approval of this course/program have on current course offerings? Please discuss number of sections of current offerings, dropping of courses, etc.

This course completes the new science education sequence designed for elementary education majors. After the pilot offering, we anticipate that all elementary education majors will take this course; thus, we will offer four sections/year, assuming the elementary education program continues to admit approximately 60 students/semester.

Addition of this course to the WSU curriculum will ultimately reduce the number of sections offered in other University Studies Natural Science courses that elementary education majors currently take. No existing courses will be dropped; departments will just offer fewer sections of existing courses.

3. What effect would approval of this course/program have on the department supplies? Include data to support expenditures for staffing, equipment, supplies, instructional resources, etc.

No impact. All resources that support this course have been purchased with grant money already secured. Students will be charged a course fee to cover expenses associated with required field trips so that there will be no impact on departmental operating budgets. The department will only need to replace simple consumables, which can be purchased at grocery stores or stores like Target. The purpose here is to use easily obtainable materials so that future teachers become familiar with developing course activities on a low budget.
# WINONA STATE UNIVERSITY
**APPROVAL FORM**

Routing form for new and revised courses and programs.  
Course or Program: SCIE 401

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A. 1. Course Description: SCIE 401 - Investigative Science III: Scientific Investigation of your Environment – A field-based integrated experience designed specifically for elementary education majors. Inquiry-based exploration of biological, chemical, geological, and physical characteristics of environmental problems facing the local community. Focus on development of pre-service student pedagogical content knowledge and connections to state and national science education standards as relates to teaching science in elementary schools. Field trips required. Enrollment limited to elementary education majors. Offered yearly. Lecture and laboratory combined. Prerequisites: SCIE 201; EDUC 335; Admission to Teacher Education Program.

A. 2. Course syllabus:

Investigative Science III: Scientific Investigation of Your Environment

A. Introduction to Field Techniques
1. Safety
2. Location
   A. map-reading
   B. satellite imagery
3. Observation, sample collection and note taking

B. Wetlands and River Studies
1. Natural Systems
   A. Creation of wetlands/river systems
   B. Mapping local system variation through time
2. Human Impact on wetlands/river systems
   A. Destruction of wetlands
   B. Artificial wetlands
   C. Dams
3. Biological, Chemical, and Geological Interactions
   A. What can we learn
   B. What tests are appropriate for K-8
   C. Classification schemes
   D. Microorganisms
   E. Invasive Species
4. Field Study of Wetlands/River Systems
   A. Trempealeau Wildlife Refuge
   B. Latch Island
   C. Prairie Island

C. Soil Formation, Development, and Significance
1. Formation as a function of substrate
2. Formation as a function of climate
3. Field Studies
   A. CSI Trempealeau

D. Hazardous Waste
1. What is hazardous waste
2. Geological Considerations
   A. Transport
   B. Groundwater/Surface water contamination
   C. Mitigation (pollution clean-up)
3. Biological Considerations
   A. Mutations: DNA and genetics
   B. Speciation and extinction
4. Chemical Considerations
   A. Impact on biological and geological systems
   B. Clean-up/mitigation efforts
5. Field Study
   A. Winona EPA site

E. Global Warming and Climate Change
1. Natural Greenhouse Effect
2. Energy considerations
   A. Thermodynamics
   B. Transformations
   C. Energy Production
     1. Electricity (& magnetism)
     2. Energy-usage journal
3. Natural vs. human influences
   A. Earth Cycles
   B. Recent Climate change
   C. Impact on species: extinction & evolution
   D. Data analysis

A. 3. Basic Instructional Plan
   The instructional plan for this course, as well as the content, follows from the previous content course in the sequence (SCIE 201 – Investigative Science I: Earth—The Water Planet). The course will meet 3 times weekly for 2-hour blocks (six hours/week; 4 s.h. credit). The block scheduling allows more flexibility so that students can engage in investigations, some of their own design, that seek to answer fundamental questions. We intend to include a substantial field component in this course, wherein students will be required to collect data of a variety of sorts that will enable them to quantify and suggest potential solutions for each problem module. We will rely heavily on local trips to the Mississippi River (and surrounding tributaries) and the Trempealeau Wildlife Preserve (wetlands). Students will collect and tabulate their data via spreadsheet (using Excel) and analyze those data to characterize scientific problems
in their community. Lectures will be incorporated as needed to provide students the context for their investigations. We anticipate three major projects in this course: the first will focus on wetlands and invasive species, the second on hazardous waste, and the third on global warming and energy consumption and conservation.

A primary goal of this course is to teach pre-service elementary education majors how to teach science in their future classrooms (the development of such pedagogical content knowledge is considered critical to science-education reform). We seek to build student confidence in their ability to ask pertinent scientific questions and to develop appropriate investigations to answer those questions. We chose to focus this course on environmental issues because each student will be able to build on these topics in his/her future classroom. Our ultimate goal is to provide future elementary teachers an exciting and rigorous undergraduate experience with science, so that they will enthusiastically and accurately teach science in their future classroom.

As the course is developed and offered for the first time, faculty from the Departments of Biology, Chemistry, Geoscience, Physics, and Education will collaborate (supported by grant money) to ensure that every discipline is accurately represented. In following years, each of these faculty will teach separate sections. Faculty will rotate into one another's sections as needed to ensure content accuracy. The faculty team will eventually teach independent sections, after each is comfortable with content outside specific expertise areas.

A. 4. Course Requirements

Students will be required to attend class regularly, complete all assignments, and develop a capstone investigation. Exams and quizzes will provide one part of the evaluation scheme. Students will also be evaluated on the quality of their laboratory reports and experimental design. Class participation will be a factor in calculation of final grades.

A. 5. Course Materials

Required Texts:

Other Required Materials:
Laptop; colored pencils, Winona West Quadrangle topographic map, ruler, laboratory notebook.

A. 6. Bibliography

B. 1. Major Focus and Objectives of Course

This course, Investigative Science III: Environmental Issues in Your Community, is the third of three courses in a sequence of science education courses designed specifically for elementary education majors. The primary objective of this course, as well as of the sequence of courses, is to reform science education for preservice teachers at WSU. To this end, we seek to: 1) build student confidence in science; 2) build student content knowledge; 3) build pedagogical content knowledge (teach students science in a way that models how science is best taught to K-8 children); 4) build enthusiasm for science and teaching science; and 5) foster student curiosity about science. We will accomplish these goals by developing a hands-on, inquiry-based, integrated curriculum around problems common to many Minnesota communities.

B. 2. Contribution to Curriculum

This course contributes to the curriculum for elementary education majors. At the request of the Department of Education, the natural science departments have developed this course. This is the third course in a sequence of three courses: the first is SCIE 201 (Investigative Science I: Earth—The Water Planet), which was offered for the first time in fall 2003; the second is EDUC 335 (Elementary Methods in Science). Once fully developed, this sequence will be required of all elementary education majors, providing all WSU elementary education majors a unified experience in science designed specifically to address state and national science standards and to improve WSU students’ ability to teach science in their future elementary classrooms.

B. 3. Courses to be dropped

We do not anticipate dropping any courses as a result of this course. However, we will offer fewer sections of other university studies natural science courses, since the elementary education population will shift into this new sequence.

C. Impact on other departments

C. 1. This course most directly impacts the Education Program. All elementary education majors will be required to take this course.

Because of the integrated nature of this course, there is no duplication of content from a single course in any department. Representatives from Biology, Chemistry, Geoscience, Physics, and Education have been and will be involved in the development of this course. Naturally, the content will overlap some parts of introductory courses in each of the natural science disciplines. However, since elementary education majors will be required to take this course, rather than any other approved University Studies natural science course, there is little chance that the student will have much duplicate content.

C. 2. Approval of this course will not change the total number of credits required by any department. We are essentially substituting this specific 4-credit course for the currently available 4-credit natural science options in the university studies program.

C. 3. Because a team of faculty from the Departments of Biology, Chemistry, Education, Geoscience, and Physics is developing this sequence of courses, all relevant departments and programs have been notified and have contributed to the course.
D. University Studies

If approved as a new course, we will submit the course for approval as an Arts & Science Core: Natural Science course in the University Studies program. The course will not be offered if not also approved for credit in the University Studies Program.

NOTE TO A2C2:
This course is being submitted by the Geoscience Department on behalf of the Departments of Biology, Chemistry, Education, Geoscience, and Physics. We are working with the Administration to create a new division of Science Education, where this course will eventually be housed. Once the division is established, we will move this course to that division. It is important that the course be approved now, prior to creation of the Science Education Division, so that we might offer this course next fall, as required by the grant obtained to support the course development.