COURSE PROPOSAL FOR PHS 199

SCIENTIFIC RESEARCH METHODS

General Information

Meeting Time:	Daily 8:00 AM to 9:00 PM
Duration:	**On NAU Campus**: June 12 through July 16, 2004
Credit Hours:	3 Credit Hours
Instructor:	Terry Hubbard
Office Hours:	The Four Corners Program staff will offer office hours by appointment.

Course Pre-requisites

Students must be high school students with substantial economic need and academic potential who have been chosen on the basis of a detailed application. For admittance to the course, students must have successfully completed at least one semester of Algebra I and one high school science class. They must demonstrate a need for the program by meeting federal TRIO low-income guidelines and/or be potentially from the first generation in their family to earn a four-year college degree. They must indicate a desire to improve their high school GPA and college entrance exam test scores. The Project Director and Program Coordinator both review student's applications. The U.S. Department of Education, through the Four Corners Upward Bound Math and Science Program funds all staff salaries.

Course Description

The proposed course was designed to mimic the process of undergraduate research and provide rising 10th, 11th, and 12th grade students with an interdisciplinary research experience. Course design and materials were tested during the summer of 1991 NAU - Summer of Science program supported by the National Science Foundation and the 1993 - 2003 Four Corners Upward Bound Math and Science Program funded by the U.S. Department of Education.

The course has three phases of activities, each phase building on the content and training of the previous phases.

Phase I – Week One Of The Program:

Coursework will include technical skills required to select colleges and apply to them, and a review of college pre-requisites including coursework and standardized test scores. Rising- 12th graders, will receive technical on-line assistance, along with their parents, to complete the Free Application for Federal Student Aid (FAFSA). They will also be given an introduction to the verification process both by the federal processor and a sample of what college financial aid offices will request. All students will be introduced to research skills and prioritize which research project they would like to investigate.

Phases I and II -Weeks One Through Five Of the Program

Supplementary daily core courses in math, reading, English, and science will be tailored to each student's individual needs. Students will be introduced to hand held computers to increase their familiarity with computers. To facilitate each student's transition from high school to college, each student will meet weekly one-on-one with an academic advisor to receive assistance with formulation of their career goals, and to plan a course of study throughout high school. Rising 12th graders will apply to college and for financial aid. Active involvement in language classes (Navajo and Spanish) will occur on Wednesday evenings.

Phase II – Weeks Two Through Five Of The Program
Each morning students will be actively involved in a Science, Math, or Engineering Research project under the guidance of a Research Advisor. These students will present the results of their research at the annual conference. Students who have conducted research the prior two summers with the Four Corners Project will be enrolled in a work experience opportunity in lieu of the research project. These students will debrief with the project director each Friday.

Phase III – Week Six of the Program
As an incentive for students to participate in the program at least two summers, the rising 12th grade students will participate in a sixth week of activities on a Senior Trip. The trip will include visits to college and university campuses, and taking part in cultural and science related events.

Reading Materials

Course materials include a broad range of readings from the original scientific literature as well as resources developed by the instructors. The Four Corners Program provides all materials to the students.

Course Objectives

1.Introduce students to interdisciplinary research.

2. Provide training in the ancillary skills needed to "do" Science (1) technical writing; (2) reading complex literature; (3) basic mathematics principals (4) experimental design and statistics; (5) acquisition of information in libraries and computer databases.

3. Provide students with the basic foundation in core courses including English, reading, math, science reasoning, and foreign language. Advise students to enroll in college bound and advanced placement classes in their high schools.

4. Develop effective time saving study techniques in each subject by improving students abilities to communicate with current and future instructors on quizzes, preparing for quizzes, and one-on-one career preparation assistance.

5. Familiarize students with research experiences in areas: such as engineering, laboratory or field biology, chemistry, physics or applied sciences and applied mathematics

6. Provide students with the skills, and network of professionals, necessary for college/university entrance.

Evaluation Methods

Students will be evaluated by at least eight methods:

1. Use of pre- and post- test assessments of reading, math, English, and science reasoning skills, and foreign language skills in Spanish and Navajo.
2. Use of student portfolios to select colleges, meet college entrance requirements, apply to colleges, and apply for financial aid.
3. Quizzes to ensure students remain abreast of the material. To become familiar with being "quizzed" frequently which will reduce students' anxiety of taking quizzes because they will learn how to anticipate and prepare for them in each subject area.
4. Instructor evaluation of students' participation in classroom discussions and research internships, including the quality of their contributions.
5. Evaluation of scientific paper, and presentation.

This is a graded course. Each student's final grade will be based on the average of grades from all subjects including career exploration paper and presentation, science, reading, math, English, and foreign language. Students who are entering their sophomore and junior years in high school must participate completely in phases I and II of the program. Students who are entering their senior year must participate in phases I, II, and III, including financial aid preparation on alternate Monday evenings. If a student does not satisfactorily complete all required phases of the program the student will fail the course and earn a grade of an F.

Topics Covered During Course

1. Experimental Design and Statistics
2. Interdisciplinary Research: An Analysis of Methods of Studying and Publishing Scientific and Mathematics Literature
3. Science-Technology-Society: An Analysis of the History, Philosophy, and Ethics of Science in Societal and Technological contexts.
4. Research Methods in:
   a. Biology
   b. Chemistry
   c. Engineering
   d. Mathematics
   e. Physics/Astronomy
   f. Applied Sciences
6. Basic skill development in reading, English, math, foreign language.
7. Post-Secondary School Application Process
   a. Comprehensive assistance in the application process
   b. Comprehensive assistance in the identification and application for financial aid