FIPSE (1)

THE COMPREHENSIVE PROGRAM
FUND FOR THE IMPROVEMENT OF POSTSECONDARY EDUCATION

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TITLE PAGE

Preliminary X Final ____ Continuation ____

This Application should be sent to:
No. 84.116A
U.S. Department of Education
Application Control Center
Room 3633
Washington, D.C. 20202-4725

1. Application No.

2. Employer Identification No.

3. Project Director
(Name and Complete Mailing Address)
Joseph Andrade, Ph.D.
Director, Center for Integrated Science Education (CISE)
2480 MEB, University of Utah
Salt Lake City, Utah 84112
Telephone: (801) 581-4379
Fax: (801) 585-5361
e-mail: jdandrad@cc.utah.edu

4. Institution Information
Highest Degree Level
____ Two Year
____ Four Year
____ Graduate
X Doctorate
____ Non-Degree Granting
____ Other

X Public
____ Private

5. Federal Funds Requested

1st year only	64,476
2nd Year (If Applicable)	63,476
3rd Year (If Applicable)	0
Total Amount:	127,952

6. Duration of Project: 2 years

Starting Date	9/95
Ending Date	8/97
Total No. of Months	24

7. Proposal Title: Science by Seduction -- Using Personal Interests and Community Projects

8. Brief Abstract of Proposal *(DO NOT LEAVE THIS BLANK)*

We propose to design, develop, implement, and test Science by Seduction (S/S), a concept-, inquiry-, and experiment-based course/laboratory for science "fearing" undergraduates. S/S focuses on major science concepts, applicable to all science "discipline." S/A is intentionally multi- and inter-disciplinary, using students' personal interests for motivation and connection. Groups work on activities for a local interactive science center to implement their interests in a community service setting. Local and national dissemination efforts include university student newspaper stories, features, and art, including appropriate Internet distribution.

9. Legal Applicant
(Name and Complete Mailing Address)
University of Utah
Salt Lake City, Utah 84112

10. Population Directly Benefiting from the Project
100 undergraduate non=science majors each year (200 total)

Congressional District(s) of the Institution
Cong. Dist. #2

11. Certification by Authorizing Official

The applicant certifies to the best of his/her knowledge and belief that the data in this application are true and correct and filing of the application has been duly authorized by the governing body of the applicant and the applicant will comply with the attached assurances if the assistance is approved.

Name: J. D. Andrade
Signature: J. D. Andrade

Director, Ctr. for Integ. Sci. Ed. (801)581-4379
Title Phone

October 12, 1994
Date

Form ED 40-514, 7/94

Project Description: *Rationale and General Objectives*

Our complex society requires that citizens and residents begin to assume greater social responsibilities. Professionals and common citizens must be equipped to deal with a variety of technical and scientific issues and controversies. Most of our college/university educated population have not developed appropriate interests and backgrounds in scientific concepts and processes, including semi-quantitative critical thinking skills. A large group of our citizenry, including university, college, and high school students have science fears and anxieties which are often reinforced in traditional science classes. Leonardo da Vinci, the icon and inspiration for the evolving Utah Science/Arts Center, perhaps said it best: "Just as eating against one's will is injurious to health, so study without a liking for it spoils the memory and it retains nothing it takes in." Practically all educators and parents will agree that when an individual is motivated, learning comes more easily.

The major objective of this project is to take individuals who are very poorly motivated in scientific and technical topics, to learn what does motivate them, and to use that interest or subject as the door through which we can expand their interests and their learning. We call it *Science by Seduction.* We "seduce" them, and use that interest and motivation to induce them to learn and do topics and activities which they otherwise would resist.

Proposal:

We propose to design, develop, test, and implement *Science by Seduction*, a concept- and inquiry-based course for science-"fearing" university undergraduates who do not intend to major in a science or technical area. *S/S* focuses on major science concepts, applicable to all science "disciplines." *S/S* is intentionally multi- and inter-disciplinary, considering science as an integrated set of concepts and phenomena. Working in small groups with similar interests and motivations, the students will develop projects for the further probing of that particular interest. This will be done in the unique Leonardo Laboratory of the Center for Integrated Science Education, a science laboratory/workshop which we already use for elementary teacher inservice courses.

Let us consider a student who has a particular interest in painting. Together, with a group of several other students with similar interests, the students will experiment with painting, with various colors or pigments, various textures, various media. They will examine the lighting, its color, its direction, its intensity. They will examine the characteristics of the media used -- acrylic, oil, water-base, and the characteristics of the support used -- canvas, glass, metal, plastic, and a variety of other issues and topics. They will be guided and advised by a group of instructors and TAs who have strong scientific backgrounds coupled with broad interdisciplinary interests and perspectives. The goal is to involve them in experimentation and the asking of questions which can lead to hypotheses, followed by more structured experimentation and exploration, followed by synthesis and then understanding to the level where they can begin to make predictions, i.e., to get them involved in the scientific method and the scientific process.

During this process the group themselves, guided by the instructors and TAs, are expected to discover the major scientific concepts and themes which are common to all areas of science and technology (Ref. 1) (see Figure 1, page 5).

The general concepts and topics for the 3 quarter, 30 week course are derived from the national reports and curricular reform movements which have proliferated in the last several years, particularly *Science for all Americans* (1), and from interviews and interactions with university science faculty as well as input from practicing scientists, engineers, and physicians.

The themes to be discovered and covered, together with an understanding of student conceptions, fears, and their own perceived needs, will lead to the selection and the development of materials and modules for sensing and discovery of the key integrated concepts.

We also propose the development of an independent research experience as part of the university's undergraduate research experiences program. At present the program is implemented by someone with a particular interest, making arrangements to do research in a professor's research group, who generally shares the same subject interest. Thus it is very unlikely in our present program that non-science majors ever get involved in a science research group. They simply to not have the background to efficiently and productively contribute to the research output of that group.

Those professors genuinely interested in the education of non-scientists and who take such people into their groups often find the experience very unsatisfying because the background and expectations of the other students (undergraduate as well as graduate) in the group tend to demoralize the unprepared undergraduate.

We will use a different mechanism, involving our students with the informal science education community, i.e, local science museums/centers. We are fortunate in that there is a large local project to design and build a major hands-on, interactive, science/arts center in Salt Lake City. This project is well into advanced planning, including the development of interactive hands-on exhibits and activities emphasizing the connections and synergism between science and art. A small mobile version of the science center, Leonardo on Wheels, is now in the final design process and will be implemented over the same time frame as this proposed project. Students with interests in particular subject or topic areas will work closely with informal science education volunteers and professionals on projects which will eventually be implemented in Leonardo on Wheels and later in the permanent Utah Arts/Science Center.

In Summary:

The students will explore their interests and thereby discover major scientific concepts and themes, the scientific process and scientific method, and the general development of critical thinking and observation skills. This will all be expanded in the second quarter, including the development of preliminary hands-on, interactive exhibits and activities by which to efficiently "teach," i.e., allow others to experiment and discover these interests and principles. In the third quarter they will take this experience and use it to become key participants of the Leonardo Project design and implementation team, a major community service component. During all three quarters there will be an extensive writing component. Individual and group writing assignments will consist of newsy press releases, more in-depth and explanatory features, and art work intended for publication in college and university newspapers, locally as well as nationally.

We look forward to submitting a more detailed, full proposal.

References:

1. F.J. Rutherford and A. Ahgren, *Science for All Americans* (The Project 2061 Report), Oxford University Press, 1990.
2. H. Gardner, *Frames of Mind: Theory of Multiple Intelligences*, Basic Books, 1985.

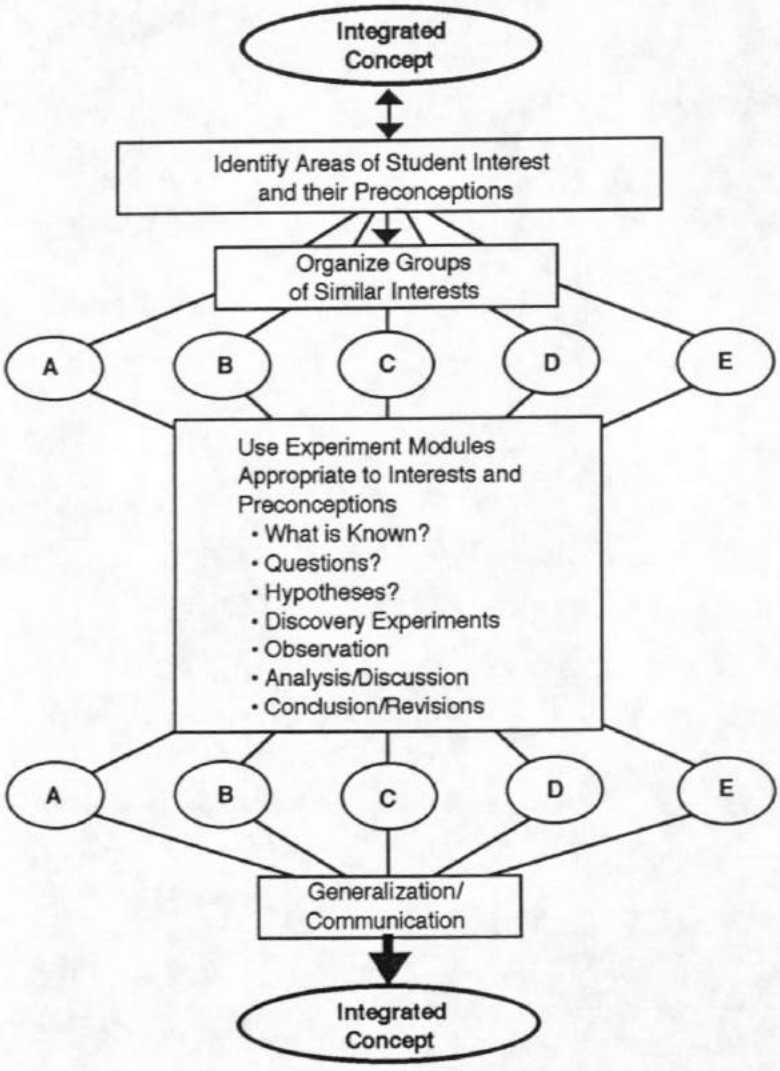

Figure 1. The Development of a Typical Concept Module (see text).