UTAH SYSTEM OF HIGHER EDUCATION
TECHNOLOGY & DISTANCE EDCUATION INITIATIVE
UTAH ELECTRNIC COMMUNITY COLLEGE
1999 CURRICULUM DEVELOPMENT RFP

PROPOSAL COVER PAGE

1. APPLICANT INSTITUTION(S):	
SPONSORING UNITS:	University of Utah Center for Science Education and Outreach (CSEO)
2. COURSE/PROJECT TITLE:	**Enhancing the availability, efficacy, and enrollment of Science Without Walls**
COURSE NUMBER:	Bioeng 1510 Science Without Walls (3 semester credits)
UNITS OF CREDIT:	Formerly Lib Ed 144 (5 quarter credits)
3. COURSE/PROJECT DIRECTOR	
NAME:	J. D. Andrade, co-Director, CSEO
COLLEGE/UNIT:	co-Chair, Dept. of Bioengineering
PHONE:	581-4379 (FAX: 585-5361)
E-MAIL ADDRESS:	joe.andrade@m.cc.utah.edu

4. COURSE/PROJECT ABSTRACT:

Science Without Walls is a 40 half hour program telecourse developed with partial HETI and Univ. of Utah support and airing regularly on Channel 9. The programs have been very favorably received by the Channel 9 viewing audience. The course is unique in providing a comprehensive, integrated, coherent treatment of physics, chemistry, and biology and was designed for students not planning to major in the sciences or related fields. Many students and faculty have asked why the course could not also be available via other institutions in the System.

I propose to work with all interested institutions in the System who may wish to offer the course as part of their curriculum. Since the textbook and lab kit are readily available, and since the course regularly airs on Channel 9, the only real need is to work with interested instructors at other institutions so they feel comfortable in offering the course, producing exams, grading homework and labs, and otherwise advising and interacting with students in the course. Offering the course through multiple institutions would significantly increase overall enrollment and thus make better utilization of this unique resource; such an approach may also help minimize duplication and interinstitutional competition and actions which are not in the best interests of the System of Higher Education.

I also propose to much more thoroughly develop and enhance the course web site, including the development of student project groups, student (and faculty/TA) discussion groups, and audio (telephone) as well as internet on line office hours. There would also be an internet means for all course instructors and TAs to communicate and interact.

7. BUDGET TOTAL $ 16,300	MATCH TOTAL $
SIGNATURES	
PROJECT DIRECTOR:	CHIEF ACADEMIC OFFICER:
DATE: 5/5/99	

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BUDGET SUMMARY

COURSE TITLE: Science without Walls
PROJECT DIRECTORS: J.D. Andrade
TOTAL USHE REQUEST: $ $16,800

EXPENDITURE CATEGORIES:
Note: Please be very specific in kind and type of hardware/software to be purchased. It is equally important to detail inservice hours and type of training to be given. This will assist the reviewers in the evaluation of your project.

CATEGORY	USHE FUNDS	MATCH
PERSONNEL Mary McDonald Student Assistant	$4,000 $8,000	
EQUIPMENT AND SUPPLIES Textbooks 15 @ $40 = 600 Lab Kits 10 @ $70 = 700 Office/Computer Supplies = $500	$1,800	
INSTRUCTIONAL DEVELOPMENT/PRODUCTION Web Site Design Consultant (to be selected)	$1,500	
EVALUATION (Mary McDonald, above)		
INSERVICE:		
OTHER: (e.g., travel, duplication costs, etc.) Tape Duplication	$1,000	
Total	$ $16,300	$

BUDGET JUSTIFICATION:

Personnel costs include Ms McDonald and a student assistant (see end of Project Description section below). Ms. McDonald's role will be primarily in evaluation and assessment, although she will also participate in web site design and implementation. She will also help with the communication and interaction with the other Institutions. The student's role will be primarily in the technical side of interactive web site implementation. Funds are also budgeted for a web site design consultant, probably Kangaroo Web Publishers (http://members.aol.com/shadchen/awp/awp). Supplies costs are requested for the text books and lab kits for the partners and their libraries, as well as limited funds for office and computer supplies. Funds are also requested for tape duplication, including a new set of Beta masters (via Media Solutions at the Univ. of Utah). J. Andrade's time can be considered an institutional match, including his extensive summer effort.

BACKGROUND AND SIGNIFICANCE:

Science Without Walls is a 40 half hour program telecourse developed with partial HETI and Univ. of Utah support and airing regularly on Channel 9. The programs have been very favorably received by the Channel 9 viewing audience.

Enrollment during the 1998-99 year was low, in part due to the semester conversion and change in Liberal Education course designations by the Univ. of Utah. Enrollment during the preceeding two years (quarter system) was reasonable.

The course includes an extensive laboratory component, weekly homework and lab assignments, access to the internet for many assignments, and a special, comprehensive textbook, as well as the 40 video programs. The work load is higher than the typical telecourse and comparable to that expected for an on campus intensive science laboratory course.

SCIENCE WITHOUT WALLS (subtitled Science in YOUR World) satisfies science and quantitative reasoning undergraduate requirements at the Univ. of Utah. The course is unique in

providing a comprehensive, integrated, coherent treatment of physics, chemistry, and biology and was designed for students not planning to major in the sciences or related fields.

Many students and faculty have asked why the course could not also be available via other institutions in the System. I believe it can be and should be available throughout the System of Higher Education, hence this proposal.

Although the course has an internet site (www.utah.edu/cseo then click on Science without Walls), it is a bare-bones site and must be made more interactive and flexible to be optimally useful for a distance learning, video-based course. This need is also a part of this proposal.

A locally produced, locally relevant basic science literacy and awareness course, with a strong laboratory component, offered via electronic media throughout the state, should significantly enhance the opportunity for ALL students to obtain a basic science background. Given a strong internet presence, and the fact that digital video will be available for web-based courses within a year or two, Science without Walls could be made available to Utah students now unable to access Channel 9.

PROJECT DESCRIPTION:

Task A: Science without Walls at other Institutions

As a result of very brief discussions with Dr. David Richardson, Dean of Arts and Sciences at SLCC, and Dr. Diana Spencer, Dean of Humanities at Snow College, I have concluded that there may be interest in offering Science without Walls at other Institutions in the System of Higher Education.

There is now little incentive for the various institutions to really collaborate on the development and offering of courses, with the result of considerable duplication in courses at the lower division level. Differential tuition drives budget conscious students to take as many courses as they can at the least expensive institution. This demand forces that institution to develop and provide courses which are readily available through other sister institutions. Although such actions are perfectly reasonable and justifiable for on campus, resident courses,

they make no sense (not to me!) for distance learning and/or internet based courses. Why should students at Snow College not have access to my distance learning course (Science without Walls) unless they enroll through the University of Utah?

I, therefore, propose the following:

1) Travel to each Institution in the System, provide a seminar/discussion for the science and general education faculty, and "recruit" faculty partners who might be willing to offer Science Without Walls at THEIR LOCAL Institution;
2) Provide each of those "partners" with a full set of tapes, two copies of the textbook (one for the partner and one for the Institution's library), and one Lableless Lab kit for Science without Walls;
3) Work with the partner, at his/her convenience, after having become familiar with the course materials, to enable him/her/them to offer THEIR version of Science without Walls. I assume that they will choose to develop some new homework problems and labs which reflect their personal interests and local relevance. Remember, the course is subtitled Science in YOUR World – it should be customized to the local situation. I will work with them, as needed, to facilitate THEIR modification of and offering of the course.

Task B: The Science without Walls Web Site

I propose to develop and enhance the course web site, including:

1) means for submitting and returning all homework and most lab assignments via the internet and E mail;
2) means for displaying anonymous homework, lab, and exam responses so students can personally and privately compare their performance against the expected standard;
3) provide audio (via telephone) office hours, both privately and publicly (via conference calls);
4) provide for on line course discussion groups, particularly for group homework and lab projects;

5) provide a wide range of net-based resources, mainly links to web sites which can provide supplementary resources; this is especially important for the class projects;
6) work with the experts to implement secure and confidential mechanisms for Email examinations;
7) explore the feasibility of digitizng the Science without Wall videos and making them available via the course web site (there are a variety of technical issues which must be addressed; I do not propose to do this, but rather to examine the feasibility – or infeasibility—of doing so).

Mary McDonald, Manager of the Center for Science Education and Outreach (www.utah.edu/cseo) will assist in all aspects of the project. Ms McDonald is an experienced science educator and has had substantial experience in web site design and development and education innovation assessment and evaluation. She will develop and implement a set of evaluation and assessment tools for the various parts of the project. An advanced undergraduate or a graduate student, with experience in quality interactive web site development and implementation and with science education interests, will be hired or contracted (as a consultant) to provide much needed assistance. Ms. McDonald, the student/consultant and I will utilize the expertise and resources available at the Univ of Utah and at our partner Institutions in implementing the tasks listed above.

The student will be identified in June, committed in July (assuming this proposal is funded), and we will immediately begin work. The fully interactive web site (Task B, subtasks 1 to 5) will be on line in time for the fall semester offering of Science without Walls. Tasks 6 and 7 will take longer.

Task A (subtasks 1 and 2) will be initiated in early August, with the visits and interactions planned for September and October. Subtask 3 will, of course, take longer, with completion in early December. Thus the partners and their Institutions should be empowered to offer Science without Walls as early as Spring, 2000.

BIOSKETCH - EDUCATION/PUBLIC POLICY/ADMIN

JOSEPH D. ANDRADE, JR.

Professor, Department of Bioengineering;
Professor, Materials Science and Engineering;
Professor, Department of Pharmaceutics, College of Pharmacy;
Co-Director, Center for Science Education and Outreach.

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Home: 949 Mill Creek Way
Salt Lake City, Utah 84106
(801) 484-4904

Birthdate: July 13, 1941
Social Security No: 565-52-0772

Marital Status: Married with two children

Education:

B.S., Materials Science, San Jose State University, 1965;
Ph.D., Metallurgy and Materials Science, University of Denver, 1969;

Memberships:

American Association for Advancement of Science (AAAS)
American Association for Clinical Chemistry
American Association of Physics Teachers (AAPT)
American Chemical Society (ACS)
American Institute for Biological and Medical Engineering
American Institute of Biological Sciences (AIBS)
American Physical Society (APS)
American Society of Biological Chemists (ASBC)
National Association of Biology Teachers (NABT)
National Science Teachers Association (NSTA)
New York Academy of Sciences (NYAS)
Protein Society
Utah Academy of Arts and Sciences

Honors:

Patent Prize, College of Engineering, University of Utah - 1987
Distinguished Alumnus Award, San Jose State Univ. - 1987
Governor's Medal for Science and Technology, 1992
Polymer Science Pioneers, *Polymer News* **16** (12) (1991) 367-8
University Professor (1994-1995)

Consultancies and Related Activities:

Scientific Advisory Board, Smith & Nephew, Ltd.
Whitaker Foundation Teaching Materials Board
President and Chief Scientific Officer, Protein Solutions, Inc. Salt Lake City, Utah

Academic and Administrative Experiences:

1998-present, co-Chair, Dept. of Bioengineering
1998, Interim Chair, Department of Pharmaceutics; Co-Chair, Department of Bioengineering
1992 - 1994, Vice President for Public Policy, American Institute of Medical and Biological Engineering.
1991 - Present, Co-Director, Center for Integrated Science Education (CISE).
1978 - 1981 and 1988 - 1991, Chairman, Department of Bioengineering, University of Utah.
1978 - Present, Professor, Departments of Bioengineering, Materials Science and Pharmaceutics.
7/83 - 9/87, Dean, College of Engineering, University of Utah.

Science without Walls:Science in YOUR World, Simon and Schuster, 1998.
Medical and Biological Engineering in the Future of Health Care, J.D. Andrade, ed., University of Utah Press, 1994.
"The Future of Health: The Roles of Medical and Biological Engineers," chapter 24, pp. 192-205.
"Applying Bioluminescence to General Science Education: Science Without Walls Telecourse," W.J. Hastings, L.J. Kricka, P.E. Stanley, eds, Bioluminescence and Chemiluminescence: Molecular Reporting With Photons, Wiley (1997) 188-192.
"Bioluminescence as a Classroom Tool for Scientist Volunteers," M. Hammer and J.D. Andrade in T. Baldwin, ed. Bioluminescence (1998) in press.

"Applying Intelligent Materials for Materials Education: The Lableess Lab™,"(R.J. Scheer and J.D. Andrade) J. Intelligent Material Systems and Structures, (1995) 13-21

"Using Novel Biological Phenomena to Enhance Integrated Science Education: Bioluminescence," J.D. Andrade, M. Lisonbee, D. Min, in A. Campbell, et al., Biolum. and Chemilumin: Fundamentals and Applied Aspects, Wiley, 1994, pp. 371-377

"Improved Delivery and Reduced Costs of Health Care Through Engineering," IEEE Engrg in Med. Biol. (June, 1993) 38-40.

"Bioengineering: A Model for Engineering Education," Biomedical Engineering Society Newsletter 15 (1), (1991) 3-6.

"Using Communicative Materials in the Engineering Classroom," Proc. American Society Engineering Education, 1995.

"Science Without Walls: Science in Your World," J.D. Andrade, The Scientist, April 27, 1998.

Science Without Walls: Science in Your World, a 40 program, 20 hour integrated science telecourse; includes a comprehensive syllabus and a unique Lableess Lab in Integrated Science to provide real reality experience.

Program 1	The World Of Science-The World of Art	Program 23	Very Personal Chemistry:
Program 2	Observing And Perceiving: The Senses	Program 24	Guns And Bombs:
Program 3	Patterns And Numbers	Program 25	Biologists In The Wild
Program 4	Extending Your Senses	Program 26	What Is Life? -- Diversity and Extinction
Program 5	Integrated Concepts And Themes: Systems And Models	Program 27	What Is Life? -- The Very Early Days
Program 6	Scale	Program 28	What Is Life? -- From Bacteria To You
Program 7	Constancy, Change, & Matter	Program 29	Energy In: Fuel & Light
Program 8	Energy, Disorder & Life	Program 30	Energy Out: Biomass And Work
Program 9	Physicists In The Wild:	Program 31	Information In: The Senses
Program 10	Inertia, Gravity, & Senator Garn	Program 32	Information Out: Language
Program 11	Energy, Efficiency, Entropy.	Program 33	Your Brain And Consciousness:
Program 12	Interstate Physics	Program 34	Is There Intelligent Life On Earth?
Program 13	Action At A Distance:	Program 35	Planetary Medicine: The Gaia Model
Program 14	From Magnets To Electricity	Program 36	Your Stuff: Cars And Transportation
Program 15	From Electrons To Light:	Program 37	Luck And Risk: Personal Statistics
Program 16	From Newton To Quanta	Program 38	Medicine & Health -- Yours
Program 17	Chemists In The Wild:	Program 39	Creativity -- Yours
Program 18	Your Personal Periodic Table	Program 40	Where Do We Go From Here?
Program 19	From Atoms To Molecules		
Program 20	From Metals To Water		
Program 21	From Water To Solutions		
Program 22	Molecular Alchemy:		

The textbook of the same title is published by Simon and Schuster, 1998.

Measurement in Medicine: Normal and Abnormal You! A new two semester telecourse; 30 one hour programs. In preparation with K. Horch, S. Kern, and M. McDonald.

Plus five books and over 100 papers on technical aspects of bioengineering, surface science, biomaterials, and biosensors.

Graduate Students:

Students Recently Graduated

Li Feng, Ph.D., 1993
I.-N. Chang, Ph.D. ,1995
K. Tingey, Ph.D., 1995
C.-Y. Wang, Ph.D., 1996
C.-H. Hsiung, Ph.D., 1997

Collaborators (University of Utah):

Dr. Vladimir Hlady
Dr. Robert Huefner
Dr. Steven Kern

Current Students:

J. Zhang, Ph.D. defense, July 1999
E. Stroup, Ph.D. defense unlikely
D. Min, Ph.D. defense, October 1999
C. Luo, Ph.D. defense, December 1999
C. Eu, Ph.D. defense, December 1999
R. Davies

Dr. Russell Stewart
Dr. Richard Van Wagenen