

0000TAC Center Fellowships

Course Development RFP

2001

PROPOSAL COVER PAGE

1. NAME of FACULTY APPLICANT: Joseph Andrade
COLLEGE/DEPARTMENT: Engineering/Bioengineering
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2. COURSE/PROPOSAL TITLE: Science without Walls--on the Web: Updated and Enhanced
COURSE NUMBER:
UNITS OF CREDIT: BioEng 1510 FIRST SEMESTER OFFERED:
3 Fall Quarter, 1996

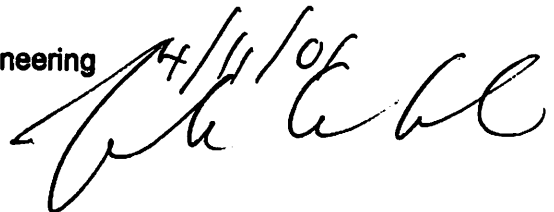
3. COURSE/PROPOSAL ABSTRACT
Update and enhance BioE 1510, Science without Walls: Science in YOUR World, now a Channel 9 telecourse, using appropriate streaming video, audio, and text; update and enhance the LabLess Lab and make use of Web-based Virtual Labs. Initial web offering: Fall, 2002.

4. BUDGET TOTAL \$

\$5000

5. SIGNATURE of FACULTY APPLICANT:

DATE: Joseph D. Andrade, Prof., Bioengineering



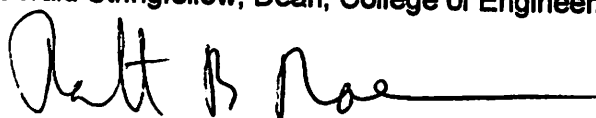
6. SIGNATURE of DEPARTMENT CHAIR:

DATE: Vladimir Hlady, Chair, Dept. of Bioengineering



7. SIGNATURE of DEAN:

Gerald Stringfellow, Dean, College of Engineering



Budget Summary (\$5,000 total plus in kind):

Student Assistant, part-time, Web issues	\$2,000
Student Assistant, part-time, video and graphics issues	\$2,000
Supplies (office, computer, graphics, video)	\$1,000

In Kind:

J Andrade is on sabbatical leave Fall, 2001 at the U of Utah; my major sabbatical project is this project; I will spend about 25 hours/week, with the goal of having this project finished by 12/30/01

Project Description (I have used one p. only; the "second page" is a published editorial which concisely summarizes the background of the project (next page):

BioE 1510 (originally Liberal Education 144 in the old quarter system) is a general education course which satisfies one of the science area requirements. It was designed and developed as a telecourse and was based on my University Professorship experience (1994-5). During 1995-6, I spent 2 full years, at about 80 hrs/week (literally!), designing, writing, and working closely with Media Solutions and (then) Division of Continuing Education (telecourses) to produce and implement Science without Walls. It has been airing on Channel 9 regularly since Fall, 1996. The Simon and Schuster textbook materialized a year or 2 later (see BioSketch). The course makes many references to the Olympics, I-15, and other soon-to-be-dated activities. It must be updated. Student and general public input, and my own experience and perspective, over the past five years should be used to produce a better, more effective course.

Although I think the Channel 9 broadcast television medium has been very effective, particularly in developing science interests and literacy in the general viewer community, I feel strongly the course should be available on the Web.

I propose to:

1. Rigorously and critically review the entire course: video, audio, graphics, text, and LabLess Lab. Improve, update, enhance, etc. the entire content;
2. Working closely with the TACC group (and other Faculty Fellows), decide on appropriate Web implementation, including video and audio components, with due concern for bandwidth, student needs, general public convenience, etc.
3. Rigorously and critically review, improve, and enhance the laboratory component and experience, particularly the LabLess Lab for Science without Walls (see next page).
4. Review and evaluate Virtual Labs and other materials now readily available on a myraid of websites and incorporate the best of these into Science without Walls.
5. Prepare a paper for J College Science Education on the Science without Walls experience and on its new, revised Web-based implementation.
6. Complete the project by 12/31/01; first web offering Fall, 2002.

by J.D. Andrade

Andr-62



Science Without Walls: Science In Your World

How should one teach nonscience majors science? In the modern university, nontechnical majors are, almost by definition, majors in the fine arts, the humanities, or the social sciences. Graduates from nonscience/nontechnical programs will not find work in laboratories, nor will they wear white lab coats or be involved with technical apparatuses, manipulations, or calculations. Their interaction with science will be in their everyday world. They should experience science in their university courses in a manner and environment that are indeed relevant to *their* everyday world—which is not necessarily the world of science or engineering faculty.

"Science Without Walls: Science in Your World," a video-intensive telecourse, is designed as an integrated, coherent, interrelated science experience for undergraduates not intending to major in science or engineering. No such course or project has previously been attempted, to our knowledge, although the book by James Trefil and Robert M. Hazen, *The Sciences: An Integrated Approach* (New York, John Wiley & Sons, 1995; 2d ed. 1998), has similar objectives.

The content was organized into 40 half-hour programs in six general sections or units: Science and Art; Physics; Chemistry; Biology; Earth; and You! To get to the wider student- and general-population audience, the course was developed for television and is now regularly broadcast on Utah's statewide educational TV channel. It uses video segments to illustrate and demonstrate processes and phenomena. The objective from the very beginning was that, wherever possible, video clips would be on the screen rather than a professor's talking head.

The design and content of the course were based on a number of pedagogical strategies. Students learn best and most effectively when the content is practical and directly relevant to their everyday needs and lives. To *experience* science, one has to *do* science. Science cannot be learned or appreciated in a spectator role. Most laboratories and researchers' technical jargon reinforce students' preconceptions that science is different from and unrelated to their interests and their world.

We minimize the use of formal laboratories, emphasizing kitchens, bathrooms, garages, and the natural outdoor world. Scientists are treated as informal, friendly, fallible, and human—and they don't wear white coats! Homework and personal laboratory experiments emphasize involvement with local museums and related institutions. Assignments also involve interaction with public and other agencies and sources as well as direct communication with local, accessible professionals, such as pharmacists and physicians.

The Labless Lab for "Science Without Walls" is a small science kit of generally available materials that the students use to conduct the experiments and observations associated with each of the 40 programs. There always has been considerable concern in offering science or other experience-based courses via television with the argument that students cannot gain the hands-on experience normally required in the laboratory components of on-campus courses. This is certainly true, but everyday materials and living situations can be far more relevant and meaningful than a formal or standard laboratory.

The normal high school sequence for the teaching of the sciences—biology to chemistry to physics—is inappropriate and illogical. We use the sequence of *first* physics, *then* chemistry, and *then* biology. This is because physics provides the fundamental rules and laws of the natural world, upon which both biology and chemistry are dependent. Chemistry provides the understanding of the elements, the molecules, and the materials of the natural world, upon which biology is dependent. Biology, although a unique science, is dependent on the rules and understanding derived from both physics and chemistry.

The various sciences are historically treated as distinct and separate in high school and even in junior high, divorced from the students' everyday world. Science must be viewed and experienced in the context of the nonsciences for nonscience students to accept and understand the relevance of science to their everyday lives. Nonscience students are interested generally in the fine arts, the humanities, or the social sciences; thus, science

must be made relevant to these disciplines and areas of study. There is particular emphasis in "Science Without Walls" on the connections and similarities between the sciences and the arts.

Students need heroes and role models. They need people and individuals with whom they can identify and whom they can emulate. We have made extensive use of individual personalities.

A unique aspect of the course is an emphasis on music. Each of the programs concludes with music tied to the content of that particular program. The pedagogical rationale here is that most students are interested in music, particularly various forms of popular music. If they can begin to see and experience the connections between science topics and the music to which they listen everyday, they will start to appreciate science and its connections to their everyday lives.

"Science Without Walls" shows that students must be responsible. University telecourses tend to attract older students with a myriad of commitments and responsibilities. The course is targeted to adults, with the goal of empowering them to act as concerned, literate, educated members of a democratic society. The course gives them the background and motivation to become appropriately involved with such issues.

The major objective of "Science Without Walls" is to provide minimum scientific literacy for the general population, including university undergraduates. The goal is not to make scientists out of them or to teach them to solve physics or chemistry problems, but to get them to understand the basic concepts and themes that underlie our natural world and to provide them with the background and confidence to take additional science courses and to become involved in the scientific and technological issues important to their nation, state, community, and family. ●

J.D. Andrade is a professor of bioengineering at the University of Utah. For more information, contact him at (801) 581-4379 or Joe.Andrade@m.cc.utah.edu. Course materials can be seen at www.utah.edu/cise.