July 9, 2003

To: Deborah J. Young  
   Associate Director, Programs

From: Gene A. Giacomelli  
   Professor and Director  
   Controlled Environment Agriculture Center

Re: Extension Education Advancement Grant:  
   “A Day in the Life of a Plant” website

Enclosed is the final report for the preliminary development of the Controlled Environment Agriculture Center’s “A Day in the Life of a Plant” website.

Support for this project was highly effective in leveraging USDA Higher Education Challenge Grant funds that will support an additional 3-year program. In this circumstance, the use of ‘seed’ money was highly fruitful!

We thank you for your confidence and support.
Extension Program Enhancement Grant:  
“A Day in the Life of a Plant” website 

CALS 
The University of Arizona 

Summary 
Preliminary construction of an expanded Controlled Environment Agriculture (CEA) website was made possible by the Extension Education Advancement Grant. Additions to the site under the heading “Day in the life of a plant” include CEA related course support, animated greenhouse simulations, and multimedia teaching modules designed to assist university and K-12 students as well as the general community to better understand the often complex concepts within CEA. A team of talented and enthusiastic web and media developers was established and supplied with training and software resources that will allow continued advancement and expansion of the online offerings of the CEA Center’s website. The graphics, HTML coding, and basic algorithms that will drive the greenhouse animated simulation modules (see figure 1) are complete. Funding also supported the acquisition of on site CEA media material, including images and digital movies soon to be incorporated into the online teaching modules available to students and community. This initial work on the new simulation modules was presented by Dr. Gene Giacomelli at the North American Colleges and Teachers in Agriculture (NACTA) Conference 2003: Developing Leadership in a Changing World, at California Polytechnic State University, San Luis Obispo, and supported the successful attainment of the Higher Education Challenge Grant proposal, “Multimedia Instrument for Worldwide Greenhouse Education”. This will lead to the implementation of the first online DITL educational materials, which will be greatly enhanced by this multi-state, interdisciplinary development program.

Project Title:  Extension Education Advancement Grant:  “A Day in the Life of a Plant” website 

Project Leader:  Dr. Gene A. Giacomelli, Director Controlled Environment Agriculture Center 

Project Team Members: 
Web Development Team:  Chris Pagliarulo, graduate student Plant Sciences, Chieri Kubota, Plant Sciences, Chris Choi, ABE, Efren Fitz-Rodriquez, graduate student ABE

User Support & Web Support Team:  Rob Call, Cochise County, Merle Jensen, Plant Sciences, Chris Jones, Gila County, Pat A. Rorabaugh, Plant Sciences, and Kai Umeda, Maricopa County, Robert McArthur, ECAT, Glen Gigstad, ECAT
1. What inputs and outputs were a direct result of the enhancement award?
The CALS-CES Program Extension Education Advancement Grant allowed us to acquire a library of website and web application development training books and software as well as critical software applications for the construction and implementation of the future website and simulation modules.

Remaining funds were allocated to students for the training for and development of the greenhouse simulation interface (see figure 1) and initial coding for the background architecture of the expanded CEA website. In addition, students amassed a vast collection of CEA related media, including images and digital movies, for inclusion into the website’s instructional modules.

Course materials for supported CALS courses have been acquired and are in the process of being formatting for web presentation. Material will be ready for Fall 2003 and will substantially improve the resources available for students taking CEA related courses, including ABE 483 – Greenhouse Environmental Control Systems (Dr. Giacomelli) PLS 475/575 – Physiology of plant production under controlled environment (Dr. Kubota), and PLS 217, 394 – Hydroponics (Dr. Rorabaugh). Other members of the community who are seeking plant biology, physiology, and CEA engineering instruction, research, and data will also find this course support material very valuable.

Initial work on the new simulation modules was presented by Dr. Gene Giacomelli at the North American Colleges and Teachers in Agriculture (NACTA) Conference 2003: Developing Leadership in a Changing World, at California Polytechnic State University, San Luis Obispo on July 16, 2003. The program was well received, and additional potential cooperators from Cal-Poly were initially contacted.

Extension of educational material directly to the taxpayers of Arizona was provided by several means, including:
(1) the development of a 30 minute ‘how to’ video (Giacomelli, G.A. and P. Rorabaugh, 2002. Greenhouse Hydroponics -- From Seed to Harvest (Video), CEAC, College of Agriculture and Life Sciences, The University of Arizona (Available for sale online at http://ag.arizona.edu/calsmart) Video/CD);
(2) a grower-oriented greenhouse educational short course (Giacomelli, G.A. 2003. Greenhouse Engineering and Crop Production Systems. Tucson, AZ. This 3-day workshop and tour attracted 65 participants from 10 North American states/provinces. Jan 19-22); and,

2. Outcomes and Accomplishments
The primary outcomes and accomplishments of the DITL web development team were the establishment and training of a talented group of media developers whose new acquired skills will facilitate:
(a) the expansion of and innovation within the CEA website
(b) the construction of a multi-disciplinary database of research, course support, and simulation modules that will aid student understanding of CEA concepts
(c) production of high quality image and video based webstreaming presentations that will eventually evolve into powerful distance learning tools utilizable by K-12, college, and community students anywhere in the world

Accomplishments completed to support the outcomes were:

- Training of web team members in Macromedia Dreamweaver, Fireworks, ColdFusion, and Flash MX web development software
- Development of graphic interface for Flash and ColdFusion based greenhouse simulation modules
- Preliminary work on driver algorithms designed to accurately simulate plant growth response to environment
- Backstage architecture and organization of entire DITL site
- Videography of student and faculty work with greenhouse crops that illustrate techniques and methodology
- Capture of tomato greenhouse images ("stills") integrated into several time lapse movies demonstrating growth and culturing practices over the course of a season

3. What additional source of funds resulted from the enhancement award? Will the project continue in the coming year?

A Higher Education Challenge Grant proposal, “Multimedia Instrument for Worldwide Greenhouse Education” was proposed and successfully achieved. Supporting funds (~$95,833 plus an additional $3000 from Dean Cox) of the total $260,000 of the overall project will become available by September 2003 for a 3-year period and will support a PhD student program as well as other student activities. This will lead to the implementation of the first online DITL educational materials, which will be greatly enhanced by this multi-state (Vermont, Ohio & Florida), interdisciplinary (Plant Sciences, Environmental Horticulture, Agricultural Engineering) development program.

Due to continued financial support from USDA, precipitated by the Education Advancement Grant, DITL website development will continue for at least for the next three years. It is our hope to continue advancing and expanding the website perpetually to reflect the new knowledge and experience acquired by the faculty, staff and students of the CEA Center.

4. Budget report

- Training software and books $600
- Web development software including Macromedia Studio MX and Photoshop 7 $900
- Student hours $1500
5. Describe how the enhancement award team functioned
The team was effective and supportive. Masters candidate Chris Pagliarulo and Doctoral candidate Efren Fitz Rodriquez provided the fundamental technical capabilities, while other faculty and staff provided the educational material. The core group of faculty and students is now in place to successfully complete the next phase of the program which will be supported by the USDA HEC grant.

Figure 1: Greenhouse simulation interface. Users can modify various internal environment variables to see interactive response of resulting plant growth.