Integrating Web Technology with Traditional Teaching of Plant Propagation©

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INTRODUCTION

The University of Florida (UF) has 13 satellite programs where various undergraduate degrees are offered in the agricultural fields. The development of these programs is part of an overall strategy to reach students who are place-bound due to jobs, families, or other community responsibilities. While development of degree programs at off campus research and education centers does pose challenges, it is generally agreed that such programs provide needed education opportunities for place-bound students, while strengthening enrollment in agriculture (Tignor and Wilson, 1999; Klock-Moore et al., 2000; Wirth and Thornsbury, 2001). Advantages to earning a degree off-campus include smaller classes, a personalized mentoring learning environment, and programs located in the heart of major agricultural areas of the state where industry support and field experiences may be more plentiful. The disadvantages to attending class off-campus include limited exposure to campus life, library resources, diversity among students and disciplines, as well as academic diversity. The development of web technologies and interactive video has created an opportunity to now merge the satellite programs and the main campus. While distance education has been utilized in one form or another for many years (Jackson, 1995), the University of Florida is pioneering a concept of bringing students, faculty, and expertise together utilizing videoconferencing or satellite in combination with computer technologies. The objectives of this paper are to describe the integration of these technologies in development of a statewide plant propagation course for delivery via interactive video via multiple locations.

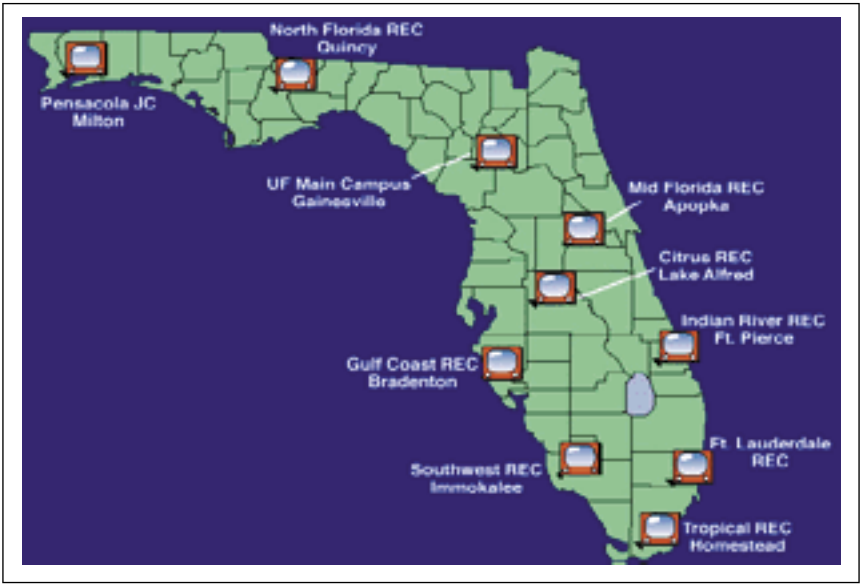

Figure 1. Distribution of University of Florida, IFAS Videoconferencing Network utilized for delivery of plant propagation with lectures originating from Milton or Ft. West Florida RECPierce and received at Gainesville, Apopka, Ft. Lauderdale and Homestead.

Plant Propagation Multi-site Teaching Team. Plant propagation is a course traditionally taught on site at Gainesville, Milton, Fort Lauderdale, and Fort Pierce and will be taught as part of the new programs located at Apopka and Homestead (Fig. 1). In 2002, a new hybrid course in plant propagation was developed and taught where six classes were merged into one via interactive videoconferencing. The expertise and teaching experience of each instructor was merged into one class while resident faculty at each site taught the laboratory. The development of such a course was facilitated by the establishment of a teaching team comprised of all plant propagation instructors and individuals identified at the various new satellite programs with the responsibility for teaching plant propagation (Wilson and Thetford, 2001).

Integrating Technology and Course Organization. A variety of delivery methods may be employed within the structure of distance education courses depending on the content and structure of the particular course. Delivery methods for distance education courses include interactive videoconferencing, videotape lecture series, World Wide Web, and Web Course Tools <http://disted.ifas.ufl.edu>. The plant propagation lecture course was originally designed to be an interactive video lecture course but has developed into a hybrid lecture course taught by utilizing a multitude of delivery methods. The decision to utilize additional delivery methods evolved as the interactive video portion of the course was designed to provide 75% of the lecture material with the remaining 25% of the course web-based. These proportions were based on the development of a course outline that divided the lecture portion of the course into 6 modules (Table 1.) Within each module, national experts were identified and invited to participate in the development of web-based

Table 1. Course modules demonstrating the relationship between videoconference lectures and web-based lectures or demonstrations for a lecture course in plant propagation.

Module	Interactive videoconferencing	Lectures web-based lectures
1	How Plant Propagation evolved in Human Society Biology of Plant Propagation The Propagation Environment	**Dr. D. Clark:** Biology of Plant Propagation **Dr. G. Giacomelli:** The Propagation Environment **Knox Nursery:** Tour of Facilities **Knox Nursery:** Discussions of facilities with Dr. Sandy Wilson and Dr. Giacomelli
2	Principles and Practices of Seed Selection Techniques of Seed Production and Handling Principles of Propagation by Seed Techniques of Propagation by Seed	**Dr. B. Dehgan:** Pollination Biology **Dr. M. Tignor:** Unusual Types of Seed Development **Dr. S. Wilson:** Plant Life Cycle: Animation **Dr. Kim Moore:** Techniques of Seed Production and Handling
3	Principles of Propagation by Cuttings Techniques of Propagation by Cuttings	**Lake Brantley Plant Co.:** Tour of Facilities **Lake Brantley Plant Co.:** Discussions with Dr. F. Davies and Dr. M. Thetford **Dr. F. Davies:** Propagation By Cuttings
4	Principles of Grafting and Budding Techniques of Grafting Techniques of Budding	**Dr. J. Williamson:** Grafting and Budding Lecture **Dr. J. Williamson:** Demonstrations of Grafting and Budding
5	Layering and its Natural Modifications Principles and Practices of Clonal Selection Propagation by Specialized Stems and Roots	**Dr. S. M. Sheiber:** Genetic Chimeras Within Clones
6	Principles of Tissue Culture for Micropropagation Techniques for Micropropagation	**Dr. M. Kane:** Principles of Tissue Culture for Micropropagation and demonstration of Micropropagation **Agri-starts: Inc.:** Production sequence and greenhouse innovations. **Dr. W. Vendrame:** Somatic Embryogenesis

lectures to supplement the topical information presented within the interactive video lectures, demonstrations or discussions. Animation of the plant life cycle and video recording of guest lectures and discussions of up-to-date information were two components of the course developed utilizing new web-based technology.

Developing an Animated Life Cycle of Angiosperms. Over the years, the authors have noticed that students have difficulty conceptualizing the detailed life cycle of angiosperms, including anther and ovule development, pollination, and fertilization. This premise initiated the idea to animate the life cycle of angiosperms. Technical information and graphic ideas describing the life cycle process were relayed to the Center for Instructional Technology and Training (CITT) at UF, who oversaw the project in coordination with the Web Implementation Center. Because of the desire to animate and audio-narrate the life cycle to allow more effective examination of the various stages and processes, Macromedia Flash (Macromedia, Inc., San Francisco, CA) was used as the primary development and delivery program and Sound Forge (SonicFoundry, Madison, WI) was used to record and produce the digital audio. By using a common browser plug-in, Flash allowed for widespread ease of use. The basic life cycle was redrawn from a combination of various graphics. Using this as a template, additional elements were added as needed for enhancement and clarification. These included a series of "popup" animations that provided greater detail at certain stages of the life cycle, and an animated bee that initiates the process of fertilization. At the beginning of the animation, the bee was coordinated with music to interject some initial humor and generate interest. Voice narration was linked to each step of the life cycle to personalize the animation and explain key components of the life cycle process.

Guest Lectures. Topical experts were invited to participate in the development of lecture modules through the recording of 20- to 40-min narrative PowerPoint presentations. These presentations were created in the form of streaming video that can be viewed from a personal computer through WebCT at the convenience of the student. In addition to streaming video, guest lecturers created handouts with images of the slides within the presentation so students could follow along and take notes. Utilization of this technology provided an opportunity to expand discussion on topics within the course from a regional to a national perspective.

Guest lecturers also visited a multitude of propagation facilities in Florida and discussed the practical application of the latest technology or methodology employed by propagators at these sites. Each nursery demonstration or tour was designed to compliment the narrated PowerPoint lecture that provided further in-depth detail on the topics. This application of video technology provided an opportunity for place-bound students to experience various propagation and production nurseries throughout the state that would otherwise not be available at a given satellite location.

A common issue for place-bound students relying on internet connectivity for streaming video or other classroom instructional materials is the limited speed of modems in their personal computers or occasional interruptions of service from their internet service provider. In anticipation of such student communication problems a Compact Disc (CD) was developed to incorporate the tours, the guest lectures and their accompanying lecture outlines, and the plant life cycle animation. The CD was organized into 6 modules to complement the lectures and the textbook and distributed to each student in the class.

Figure 2. Compact disc developed for the delivery of streaming video lectures, lecture notes, nursery tours, and the plant life cycle animation to supplement videoconferenced lectures for statewide delivery of Plant Propagation.

Coordination of a Plant Propagation Laboratory at Multiple Sites. The teaching team recognized that the independent plant propagation lab courses could benefit from coordination of the laboratory exercise content. While members of the teaching team had previously developed and taught laboratory sections of plant propagation, the addition of new sites with various levels of facility, equipment, and materials availability could be a disadvantage to developing a cohesive statewide laboratory course. The coordinator of the plant propagation teaching team, through input from the plant propagation teaching faculty, facilitated the development of a list of common laboratory topics or concepts, and sequence of delivery to compliment the six course modules. The idea was for the individual lab instructors to retain responsible for the development of site-specific laboratory exercises and activities based on the equipment, materials, and plant species available at a given site. Additionally, laboratory examinations are developed, administered, graded, recorded, and reported by the lab instructor.

Based on this model, one member of the teaching team provided leadership in obtaining outlines, materials lists, and classroom handouts for all plant propagation laboratory exercises taught statewide. These materials were organized on the basis of topic and provided to all instructors statewide with the aid of WebCT, thereby allowing instructors at each site to choose from laboratory exercises that match local facilities, equipment, and material availability.

CONCLUSION

The integration of web-based technologies with traditional teaching of plant propagation has resulted in the development of a hybrid course that utilizes an innovative approach to teaching. The coordination effort required to develop this course has also resulted in the integration of experiences from many professionals, many recognized nationally for their expertise. Additionally, utilization of technology such as WebCT provides integrated internet-based communication within the learning environment thereby allowing both active and collaborative learning among the classrooms with the aid of discussion groups and chat rooms. Utilization of common Internet browser plug-in technology such as Flash, allowed for integration of animated educational materials with widespread ease of use. The addition of guest lectures addressed the limited academic diversity associated with off-campus programs while linking the various classrooms through discussion groups addressed the issue of student diversity. As the implementation of this course model continues, opportunities to address the remaining disadvantages associated with off-campus programs may also be addressed.

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