Teaching Methods

Virginia Polytechnic Institute and State University's Extended Campus Master of Science Degree Program in Horticulture

Bonnie L. Appleton[1] and Susan C. French[2]

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Summary. **In general, students desiring graduate degrees in horticulture have few options other than main campus based programs. An extended-campus Master of Science degree program in horticulture, based at Virginia Polytechnic Institute and State University's (Virginia Tech) Hampton Roads Agricultural Research and Extension Center in Virginia Beach, offers an alternative to students 300 miles (482.8 km) away from Virginia Tech's main campus in Blacksburg. Existing facilities and a pool of six extended campus faculty are used to offer a nonthesis degree to locally employed horticulturists, or to students desiring a career change.**

Expansion and diversification in the field of horticulture are necessitating changes in the delivery of college-level horticultural education programs. Where previously students would establish residence at a university to seek a Bachelor of Science and then a Master of Science degree, the proliferation of distance education courses now offered at many universities has made it unnecessary for students to be present on campus to receive a first-class educational experience (Decoteau, 2001). Some universities have established extended-campus (off-campus) programs to provide more convenient access to educational opportunities. In addition, a Master of Science degree, once considered somewhat superfluous within many horticultural industries, is sometimes now mandatory.

Distance education (DE) and extended-campus (EC) programs are closely related but are not synonymous. DE involves physical separation of teachers and students, with technology used to bridge the gap. Technological tools employed in DE include videotapes, satellite television, telephone/video conferencing, and the Internet. In a recent survey of 1,000 colleges and universities, of those offering DE, most delivered courses using videotapes and/or the Internet (Ballon, 1999).

EC refers to university-supported educational programs that are situated away from main campuses. EC courses typically offer smaller class sizes but may utilize some DE techniques. Students who seek face-to-face teacher/student interaction may prefer EC to DE courses. Although most public universities offer some types of DE programs, agriculture and natural resources courses make up less than 1% of their DE enrollment (Pardue, 2001). While DE programs, which have evolved from correspondence courses to sophisticated telecommunications courses, are increasing at universities that offer horticulture programs, far less common are actual EC programs.

Program background

Virginia Tech, one of Virginia's two land-grant universities, is unique in offering the only EC Master of Science (MS) degree in horticulture in the United States. Virginia Beach, Va. was selected for an EC program because it is part of a highly populated area in southeastern Virginia known as Hampton Roads. Hampton Roads, comprised of nine cities and five counties, is the twenty-seventh largest Metropolitan Statistical Area (MSA) in the U.S. with a population of roughly 1.5 million (U.S. Bureau of Census, 2000).

Due to its coastal location and relatively mild climate (USDA climatic zone 8a), there is a high concentration of horticultural activity in the Hampton Roads area including nurseries, greenhouses, landscape design/build/maintenance companies, and golf courses. These commercial horticultural industries provide a pool of potential students interested in furthering their education.

Virginia Tech has an EC facility, the Hampton Roads Agricultural Research and Extension Center (AREC), located in Virginia Beach. Founded in 1907, the Hampton Roads AREC evolved into a 49.4-acre (28-ha) center specializing in ornamental horticulture research, education, and outreach (extension) activities. The center has laboratories, greenhouses, and classrooms that can support a MS program.

All current Hampton Roads AREC resident faculty combine teaching with their outreach and research responsibilities. The six faculty, all qualified to teach their assigned courses, represent three departments within the College of Agriculture and Life Sciences–Department of Entomology (one PhD); the Department of Plant Pathology, Physiology, and Weed Science (two PhDs); and the Depart-

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[1]Professor of horticulture and graduate program coordinator, Hampton Roads Agricultural Research and Extension Center, 1444 Diamond Springs Road, Virginia Beach, VA 23455.

[2]Extension agent, Virginia Cooperative Extension, City of Virginia Beach, Municipal Center, Virginia Beach, VA 23456.

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Table 1. Virginia Polytechnic Institute and State University's Hampton Roads Agricultural Research and Extension Center graduate student profiles (August 1992 through May 2002).

	All students who have enrolled [no. (% total)]	Students who have graduated [no. (% total)]
Total number 1992–2002	108	42
Horticulture related BS[z] and/or MS[y]	62 (57%)	25 (60%)
AAS[x] in horticulture	7 (6%)	4 (10%)
BS/BA[w] in unrelated major	46 (43%)	17 (40%)
Master Gardeners	18 (17%)	13 (31%)
Extension agents	12 (11%)	8 (19%)
Currently employed in a horticulture related field	65 (60%)	31 (74%)
Community college instructors of horticulture courses	12 (11%)	10 (24%)

[z]Bachelor of Science degree.
[y]Master of Science degree.
[x]Associate of Applied Science degree.
[w]Bachelor of Arts degree.

ment of Horticulture (two PhDs, one MS). Faculty from Virginia Tech's main campus in Blacksburg, and from neighboring Old Dominion University in Norfolk, Va., contribute by teaching within the program. Guest lecturers who are experts in their fields, including many industry professionals, also assist in classroom instruction.

The MS program was developed at the Hampton Roads AREC for students who would otherwise be unable to attend classes in Blacksburg, 5-6 h away by car, due to job and family responsibilities. Since the program's inception in 1992, there have been 42 graduates. Registration, tuition payment, and graduate school administrative work are handled from Virginia Tech's main campus in Blacksburg, while student advisement, course development and instruction takes place 300 miles away in Virginia Beach. Graduates are eligible to attend commencement ceremonies at the main campus. The University of Florida, the University of Nebraska, the University of Wisconsin, and possibly other institutions, offer EC BS degree programs in horticulture (Klock-Moore, Fitzpatrick, and Schoellhorn, 2000); however, none currently offers an EC MS degree in horticulture.

Student background

The greatest difference between the Virginia Tech campus and EC horticulture programs is student background (Table 1). The student profile at the Hampton Roads AREC tends to be nontraditional in educational background and age. Nationwide trends indicate that graduate study at the MS level is primarily a part-time activity with students 35 years of age and older forming the largest and fastest growing segment of the student population (U.S. Department of Education, 2001). This holds true at the Hampton Roads AREC where the average student age at graduation is 45. Only slightly more than half (57%) of the 108 students who have taken one or more classes at the Hampton Roads AREC entered the program with a horticulture-related BS or MS (including agronomy, biology, and botany), with 6% of the students holding an Associate of Applied Science (AAS) in horticulture.

Seventeen percent of the students have participated in Virginia Cooperative Extension's (VCE) Master Gardener Program prior to enrolling in the program. VCE agents seeking their required MS degrees have made up 11% of the students. Sixty percent of all students who have attended classes at the Hampton Roads AREC are currently employed in a horticulture-related field. This adds relevance to their studies, shows the perceived value of the MS degree, and fuels more varied and interesting classroom discussions. Many who are not currently employed in the field are pursuing the degree to enable them to make career changes into horticulture.

Curriculum

Unlike students on campus who have the option of either a thesis or a nonthesis MS, students at the Hampton Roads AREC all follow the nonthesis option (Table 2). The Hampton Roads AREC curriculum, however, is fairly similar to that on campus (Table 3). Students at either location are eligible for their MS after satisfactorily completing a minimum of 30 credits, with both locations requiring students to maintain a 3.00 grade point average (GPA) to remain in good standing.

In general, EC courses follow the same syllabus as on-campus courses, with the flexibility to make some changes in content. These content changes generally pertain to the crops that are emphasized because the Hampton Roads AREC program is oriented towards the nursery production/landscape management/urban tree care portion of the horticulture industry.

To accommodate student day-

Table 2. Credit requirements for a Master of Science Degree in Horticulture (Virginia Polytechnic Institute and State University, 2001).

	Course level				
	4000	≥5000	4984, 5974, and 5984[z]	Research and thesis	
	Credits (no.)				
Option	Max	Min	Max	Min/Max	Total min
Thesis	12	12	6	6/10	30
Nonthesis	9	21	6	0/0	30

[z]Special studies, independent studies.

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Table 3. Comparison of Virginia Polytechnic Institute and State University main campus vs. extended-campus Masters of Science in horticulture curriculum.

Thesis option		Nonthesis option	
Campus courses	Credits (no.)	Extended-campus courses	Credits (no.)
HORT 5004—Seminar	1[z]	HORT 5004—Seminar	1[z]
HORT 5104—Introduction to Graduate Studies and Research	2[z]	HORT 5104—Introduction to Graduate Studies and Research	2[z]
BCHM, BIOL, CSES, HORT PPWS (4000, 5000, 6000 level)	9[y]	ENT 4254—Insect Pest Management	3
HORT 5504—Nutrition	3	HORT 5504—Nutrition	3
		HORT 5604—Physiology	3
		PPWS 4754—Weed Science	3
		PPWS 5204—Plant Disease Management	3
STAT (4000 or 5000 level)	3[z]		---
HORT 5994—Research/Thesis	6–10[z]	HORT 5974—Independent Study	1–6
Other courses to meet the graduate school's minimum requirements (see Table 2)[x]—may include Independent Study		CSES 5984—Special Study–Horticultural Soils	1
		ENT 6004[w]—Advanced Topics in Entomology	3
		HORT 6004[w]—Advanced Topics in Horticulture	3
Transfer credits allowed	≤6		≤15
Total required	30		30

[z]Required.

[y]Specific courses in these subject areas (BCHM = Biochemistry; BIOL = Biology; CSES = Crop and Soils Environmental Sciences; HORT = Horticulture; PPWS = Plant Pathology, Physiology and Weed Science) are not required. However, each student must take a minimum of 9 credits from the courses approved for graduate credit in these areas and also take a sufficient number of courses to fulfill the 30-credit requirement for the MS degree. Independent Study not applicable.

[x]Additional course credits in the areas listed in above footnote may apply.

[w]Developed periodically based on student interests and the need for additional courses. Thus far ENT 6004 has been offered twice (Horticultural Entomology), and three different HORT 6004s have been offered [topics: Trees—From Propagation through Maturity; Writing (for) Horticultural Publications; Sustainable Landscaping].

time employment, the Hampton Roads AREC program generally offers only one course per semester (fall and spring), one night per week. Advanced Topics and Special Studies courses, designed by individual faculty, are offered to provide a broader base of horticultural knowledge that is sometimes lacking in standard courses. As on the main campus, transfer credits are accepted from other accredited institutions toward the graduation requirement. Several students have taken and transferred courses in biology and geology from two local state supported universities, Old Dominion University and The College of William & Mary (Williamsburg, Va.).

Hampton Roads AREC students can also take DE courses offered from campus via a teleconferencing connection. There are no specific courses consistently offered DE, but students thus far have taken a variety of courses offered in Agriculture and Life Sciences (ALS) and Agriculture and Extension Education (AEE).

In order to allow students to work on projects with both campus and extended campus faculty, an Independent Study course is offered each semester in addition to the scheduled course. While projects undertaken for Independent Studies may be similar to those undertaken for a thesis on campus, Independent Studies allow greater flexibility for EC students who prefer to do education and extension projects instead of research (Tables 4 and 5).

On-campus/extended-campus comparison

There are many similarities between the MS programs in Blacksburg and Virginia Beach. Tuition at the Hampton Roads AREC is similar to that charged on campus. However, no direct financial aid, via tuition waivers or assistantships, is available to EC students. Extended-campus students needing financial aid must apply to Virginia Tech for loans or scholarships. Some EC faculty provide financial support by paying tuition for Independent Study projects they sponsor. Said support is generally requested as a line item in grant proposals.

All students must apply to the Graduate School in Blacksburg prior to registering for courses, and must hold a BS or BA degree in order to be considered for admission. Any Hampton Roads AREC students lacking basic training in biology and chemistry are required to take transfer level, un-

Table 4. Virginia Polytechnic Institute and State University's Hampton Roads Agricultural Research and Extension Center independent study projects undertaken by students who have graduated.

Type of independent study[z]		Products					
Research	Education/ extension	Referred journal articles	Published proceedings	Extension publications	Manuals	Demonstration areas	Miscellaneous[y]
19	27	6	11	9	3	6	17

[z]In total, 46 independent study projects were carried out, representing 36 of the 42 graduating students. One study did not yield a product.

[y]Miscellaneous includes reports, electronic or slide presentations, exhibits, and curricula.

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dergraduate courses in those subjects, from local universities or community colleges, as prerequisites to some courses.

Many nontraditional students granted admission to the Hampton Roads AREC EC program would not be admitted to the on-campus program; some main campus faculty wish to deal with students with stronger undergraduate science backgrounds in order for them to be better prepared for conducting thesis research. Nontraditional students are put on provisional status until they have completed at least nine credit hours and maintained a 3.0 GPA. Those who fail to meet that standard are not permitted to complete the degree.

One faculty member coordinates the program and is the initial advisor to all of the Hampton Roads AREC students. Each student then selects three faculty, including one from the Blacksburg campus, to comprise their advisory committee. Main campus graduate students are assigned advi-

Table 5. Titles of specific independent study projects students have undertaken under B.L. Appleton's direction (Spring 1993 through Summer 2002).

Year	Semester	Independent study title
2002	Summer II	Guide to Community Landscape Enhancement[z]
		Wire Baskets at Transplanting
2001	Fall	Guide to Community Landscape Enhancement
2000	Fall	IPM[y] Training PowerPoint[x] Presentation
	Summer II	Mycorrhizal Fungi in Propagation
		Hampton Roads Community Forest Guide
		Mycorrhizal Fungi for Tree Holding
1999	Fall	Tree Roots PowerPoint Presentation
		Cellugro versus Container Production
1999	Summer II	Reducing Container Heat Stress
		Southeastern Shade Perennials Book
1999	Spring	B&B[w] Tree Ball Holding Techniques—Part 2
		National Tree Trust Nursery
		VNLA[v] Certification Slides
		Mycorrhizal Fungi—Street Trees
		Rhizotron Design
1998	Fall	Plant-of-the-Year/Plant Introductions
		Pest Management Guide Index
1998	Summer II	Tree Appreciation Slide Set
1998	Spring	Fertilization and Mulching Extension Publications
1997	Fall	Market Analysis of Virginia Nurseries
		Root Ball Mycorrhizal Fungi Inoculation
		Tree Value Slide Set
1997	Summer II	B&B[w] Tree Ball Holding Techniques—Part 1
		Flower Show Tree Exhibit
1996	Fall	Wetland Plant Production
1995	Summer II	Norfolk Botanical Garden Rhododendron[u] Project II
		Norfolk Botanical Garden Tree Inventory
		Historic Garden Restoration
1995	Spring	VNLA[v] Landscape Management Certification Program
1994	Fall	Norfolk Botanical Garden Rhododendron[u] Project I
1994	Summer II	Flower Show Development
		Deer and Landscape Plants
1994	Spring	Wetland Restoration
1993	Fall	Utility Line Plants
		VNLA[v] Landscape Management Certification Program
		Wetland Plant Sources Guide
1993	Summer II	Municipal Employee Education
		International Curriculum Development
		Cut Holly Publications
		Landfill Planting
1993	Spring	Cut Holly[t] Production

[z]All but two projects were taken for three credit hours.

[y]Integrated pest management.

[x]PowerPoint, Microsoft Corporation, Redmond, Wash.

[w]Balled and burlapped.

[v]Virginia Nursery and Landscape Association.

[u]*Rhododendron* spp.

[t]*Ilex* spp.

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sors when they are accepted into the program, and they are not required to include EC faculty on their committees, although a small number do. Students on campus generally defend their thesis with a final oral exam whereas Hampton Roads AREC students generally take a written final exam composed of questions submitted by the three committee members. Though the examination process is different, the process, as well as the quality of instruction in general, is equivalent at both locations.

Alumni employment

Of the 42 alumni of the Hampton Roads AREC program, 74% are currently employed in a horticulture-related field (Table 1). Nineteen percent of the graduates have been or are employed as extension agents in Virginia, North Carolina and Florida. Twenty-four percent have taught horticulture-related courses at community colleges in Virginia, with one graduate employed as an assistant professor for Ohio State University's 2 year degree program at Wooster. The graduate program at the Hampton Roads AREC provides a valuable service to the horticultural community by training instructors for the next generation of horticulture students.

Advantages and disadvantages of EC programs

The Hampton Roads AREC program has provided graduate-level horticulture courses for 108 students, most of whom could not attend classes on the main campus. However, there are inherent advantages and disadvantages to the EC program.

Disadvantages include the difficulty of publicizing and recruiting students for the program. Although classes are advertised statewide prior to each semester in newspapers, newsletters and other publications, many potential students are still not being reached. When someone becomes aware of the program and decides to enroll, they must first be admitted to Virginia Tech and be entered into the computer system for individual online registration. This presents a challenge to students lacking computers or computer expertise, or who decide to enroll just before the start of a semester.

Offering only one three-credit course per semester limits course selection. It also extends the time needed by students to complete their degree requirements, with the average student taking 3.5 years. An additional disadvantage, due to distance restrictions, is limited interaction with on-campus faculty and resources, but this is partially overcome by visits (campus faculty to Hampton Roads; Hampton Roads AREC graduate students to campus) and e-mail communication. Due to distance and finances, frequent face-to-face interaction is not feasible.

Most graduates of the program feel the advantages outweigh the disadvantages (personal communication). An EC program encourages frequent one-on-one interaction with EC faculty and other students. EC classes don't carry the constraints of DE classes, which generally require students to demonstrate a greater aptitude for self-discipline, and to have access to electronic communications equipment. Reduced class size permits faculty to personally address students' concerns and questions. A student base that is largely composed of local horticultural professionals provides networking opportunities for students. Involvement in other EC faculty activities, such as research projects, attendance at professional conferences, trade shows, and nursery site visits, enriches the MS program at the Hampton Roads AREC.

The Hampton Roads AREC program has significantly increased total enrollment in the overall Virginia Tech MS in Horticulture program. Prior to the inception of the Hampton Roads AREC program in 1992, a yearly average of 13 students pursued the degree on campus in Blacksburg. Currently there are 43 students enrolled in the program, including 27 EC students. A benefit of EC programs, such as this one offered by Virginia Tech, is the opportunity for students to increase their professional skills and knowledge while remaining in their current employment and places of residence. In the future, economic pressures may encourage more educational institutions to offer similar EC programs designed to fill students' professional needs without the need for conventional matriculation.

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