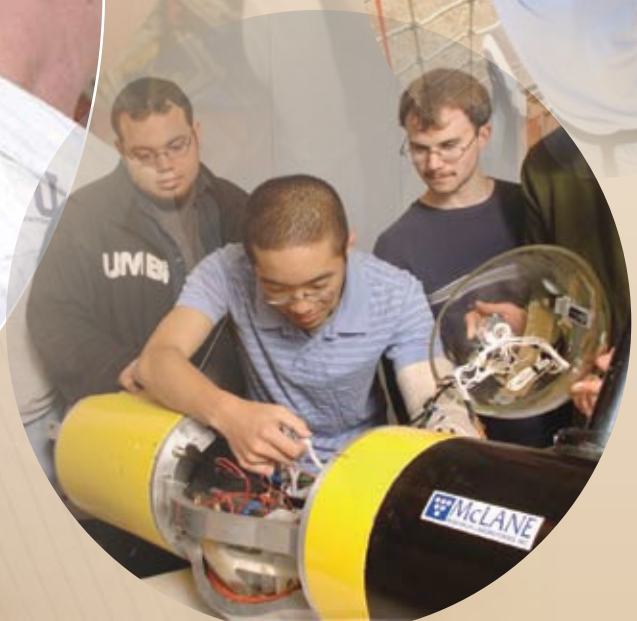
Western Carolina University

2009 WCU Research

Inside:

- Measuring the success of teacher support
- Engineering Technology goes the distance
- On the road with Talent Search
- Old bones, new scholarship
- The Appalachian tradition of grave decoration



Welcome to this edition of WCU's Research journal. Our mission at the Graduate School and Research Administration is to facilitate the scholarly research objectives of our faculty, staff, and students and to foster meaningful scientific work in support of the region, the country, and the world. Scholarly and creative activities are integral to the core academic mission of the University and essential to our development as teachers. We hope that the important work highlighted in this edition of Research serves to move others to pursue new exciting journeys of discovery. This issue of the Research journal highlights the scholarly work of some of our outstanding faculty and staff:

In the College of Arts and Sciences, Cheryl Johnston (anthropology and sociology) has been invited by the Hopewell Culture National Historical Park to conduct extensive analyses of human remains in their collections as part of the Southern Appalachian Cooperative Ecosystems Studies Unit project, and Philip Coyle (anthropology and sociology) explains the cultural importance of the North Shore Cemetery decorating tradition.

In the College of Education and Allied Professions, faculty have been working to highlight the importance of supporting beginning teachers by identifying and addressing the needs of beginning teachers. Examples of such projects include NC TEACH II and the online project START, developed by Janice Holt (Office of Alternative Licensure).

In the College of Health and Human Sciences, Judy Mallory's (nursing) grant for the School of Nursing will support creating an online master's degree program for nurses who move into managerial roles in hospitals and other health care agencies. Laura Myers (criminology) and Larry Myers (criminology) conducted a study in the Charlotte, N.C., region to document a process aimed at developing regional disaster response plans.

In the Kimmel School, James Zhang (engineering and technology) supported graduate students presenting research results at annual conferences in Pittsburg and Knoxville, Tenn. Under the supervision of Aaron Ball (engineering and technology), WCU and Asheville-Buncombe Technical Community College co-developed low-cost environmental test chamber for teaching engineering and technology students; Ball also is working to bring baccalaureate engineering technology programs on-site to regional community colleges.

From the Division of Student Affairs, Todd Murdock, director of the Educational Talent Search Program, aims to increase the number of disadvantaged young people enrolling in postsecondary institutions.

The stories in this issue of Research highlight the important work and achievements of our faculty and the significance of their work for our communities. The Research Administration staff oversees the planning and approval of grants and contracts needed to support projects like these. Transforming the economy of the region through high-quality research and scholarship to promote the highest level of education and training is the purpose of the Graduate School and Research Administration. We hope you will be inspired by these stories and take advantage of the services we offer to further your own scholarly and creative activities.

Scott Higgins, Ed.D.
Dean of Graduate School and Research

Notes from the Associate Dean of Graduate School and Research

During the past year, we have worked closely with faculty and administration to bring a focus to the pursuit of sponsored projects. In this publication, which covers only a very small fraction of the ongoing projects here at Western Carolina University, we have highlighted the work of some of our finest.

The research projects that WCU faculty perform, often with undergraduate student participation, share the vision of improving the educational experience for the student, while advancing the scholarship of faculty members.

The Office of Research Administration at Western Carolina University is committed to creating an environment that is conducive to performing sponsored research projects and creative activities. The staff is dedicated to providing university faculty, staff, and students with the support necessary to fulfill their goals of sponsored projects.

WCU faculty have been successful in increasing the number of our proposals—for individual and collaborative work—and our funding levels have continued to grow. This is due to the impressive efforts of our faculty and the dedication and support of administration. Please join me in congratulating and thanking our faculty for their outstanding work on behalf of WCU.

Michelle Hargis, Ed.D.
Associate Dean of Graduate School and Research

Contents

4 Center for the Support of Beginning Teachers

8 Engineering and Technology Graduate Students Present Research Results

10 Distance Learning in Engineering Technology: *Celebrating Success and Looking Toward the Future*

18 A Low-Cost Environmental Test Chamber for Teaching Engineering and Technology Students

26 Academic Adventure

30 WCU School of Nursing Launches Nurse Administration Program to Meet the Needs of Western North Carolina

34 The Ultimate Cold Case: *Forensic Anthropologist Sheds Light on 2000-Year-Old Bones*

36 Regional Responses to Modern Disasters: *Overcoming Regional Planning Barriers*

40 The North Shore Cemetery Decoration Tradition and the Great Smoky Mountains National Park

Center for the Support of Beginning Teachers

Janice Holt • *director*

The College of Education and Allied Professions at Western Carolina University has long recognized that effective support for beginning teachers must be provided in order to improve retention rates and teacher quality. Western understands that beginning teachers want and need a variety of supports—emotional, procedural, technical, and instructional—and that no one person or unit can provide all of these supports. In 2005, Western's Board of Trustees established the Center for the Support of Beginning Teachers. Housed in CEAP, the center is designed to address identified needs of Western North Carolina beginning teachers and build upon established partnerships, programs, and past grant-funded initiatives by consolidating and formalizing new teacher support.

The center receives funding from WCU as well as the following grants: Z. Smith Reynolds Foundation grant for Project START: Supporting, Training, And Retaining Teachers (2006-2008); and a U.S. Department of Education Transition to Teaching Grant, N.C. TEACH II (2006-11). Currently the CSBT provides professional development opportunities for beginning teachers, mentors, and principals in fourteen WNC school systems.

The North Carolina State School Board of Education requires each school system to develop and provide a Beginning Teacher Support Program plan (NCDPI, 2002) for the support and assessment of teachers during their first three years of service. Implementing the state-mandated plan is a challenge to small, rural school systems without adequate resources. Initially, CSBT services focused on the required monthly meetings for first-year teachers held onsite at participating school systems. The center also offered mentor training workshops to provide school-based mentors an understanding of new teacher development and coaching strategies. Later, principals were invited to participate in professional development opportunities to help them understand and meet the needs of the beginning teachers in their schools.

Researchers have recently examined the effectiveness of school-based mentoring as well as other approaches used to support beginning teachers throughout North Carolina and the United States. Reiman, Corbell, and Rhomas (2007) identified eight elements, or what they refer to as innovation levers, that are used in various educational settings across the nation. These levers have all individually been shown to be effective in retaining and improving competencies of beginning teachers. However, their research demonstrated that by combining these different elements, or levers, school systems could make an even stronger impact on beginning teachers. The eight levers identified include:

1) new teacher salaries
2) face-to-face time with administrators
3) mentoring
4) collaborative time
5) beginning teacher seminars
6) reduced assignment and workload
7) new teacher networking
8) assessment of new teacher support

As each lever is added, there is a significant increase in the number of beginning teachers who make the decision to continue in the teaching profession.

The need for Teacher Networking (Lever 7) has also been supported through a research project titled The Project on the Next Generation of Teachers (Johnson, 2007). This project concluded that there is a new generation of teachers entering the teaching field today. These new teachers are more diverse in terms of age, prior experiences, preparation, workplace expectations, and career conceptions in general. The "next generation of teachers" is looking for a workplace environment in which teachers can network with other faculty, but there is a generation gap between younger faculty and older faculty who tend to place more value on working alone and being autonomous and who are more resistant to change.

The "next generation of teachers" is looking for a workplace environment in which teachers can network with other faculty, but there is a generation gap between younger faculty and older faculty who tend to place more value on working alone and being autonomous and who are more resistant to change.

The original support services provided by the CSBT and school systems in the Western North Carolina region focused on levers 2 through 5 identified by Reiman, Corbell, and Rhomas (2007). While system-based monthly meetings provided opportunities to focus on topics of concern to all beginning teachers, it was difficult to provide grade-level/content-specific strategies to the small number of teachers attending the meetings. Survey data collected from beginning teachers, school-based mentors, and principals indicated that these efforts were somewhat successful in keeping more beginning teachers in the field. However, there were still too many new teachers in Western North Carolina who were leaving the field within the first five years of teaching. (The 2005 N.C. System Level Teacher Turnover Report found an average turnover rate of 12.95 percent, with one WNC system reporting a turnover rate of 18.46 percent).

In 2006, Janice Holt, director of the Center for Support of Beginning Teachers, and Beginning Teacher Coordinators in the region decided to include another induction component. Thanks to the generosity of the Z. Smith Reynolds Foundation, Holt designed an on-line support program to supplement the other supports provided to beginning teachers by CSBT and school systems. This program is consistent with Lever 7 as described above in that it supplies a missing element—providing beginning teachers a network of other beginning and experienced teachers with whom they can collaborate.

The goal of the online support program (Project START) offered through the Center for the Support of Beginning Teachers is to establish professional learning communities that connect beginning teachers to career teachers and university faculty. These connections allow for "practice-centered" conversations, promoting reflection and the integration of knowledge and practice. The online support program also provides an opportunity for new teachers to form relationships with colleagues outside the constraints of geography.

Beginning teachers participating in the program are grouped-based on the grade level and/or content area at which they teach. Groups are facilitated by e-mentors (public school teachers and university faculty in the Colleges of Education and Allied Professions, Arts & Sciences, and Fine and Performing Arts). E-mentors welcome new teachers to the teaching profession, answer questions, offer experienced perspectives on how to best meet the needs of PK-12 students, and inspire beginning teachers to persist who participated in the on-line mentoring expressed that they "strongly agreed" or "agreed" that networking was beneficial. In addition, 83 percent of the teachers who accessed the resource files found them helpful. In response to open-ended questions, the majority of teachers revealed that the online program gave them access to important advice, suggestions, and assistance from others. These findings are consistent with the 2006-07 beginning teacher surveys, with results clearly indicating that new teachers benefit from the online support program. Further analysis of the 2007-08 data will be conducted, but it appears that, for many beginning teachers, the online program provided an additional layer of support not available within their schools or systems.

Examining the effects of induction programs on retention and new

teacher development through surveys and other data gathering are part of the mission of the Center for the Support of Beginning Teachers and also represent the type of support provided by Lever 8 as identified by Reiman, Corbell, and Rhomas (2007). Lori Unruh, assistant professor of psychology, works with Janice Holt to develop, collect, and analyze annual survey data from beginning teachers, school-based mentors, e-mentors, and principals. Results are shared with school administrators, beginning teacher coordinators, mentors, new teachers, and policy makers who then work in collaboration with the CSBT to make changes and improvements to the services provided to new teachers in the region.

With the addition of Project START and the collection and analysis of extensive data, Western's Center for the Support Beginning Teachers and WNC school systems are providing a new teacher program that addresses all of the Levers with the exception of Lever 1 (new teacher salaries) and Lever 6 (reduced assignment and workload). While the center has no control over these two factors, it will serve as an advocate for change.

The 2007/2008 Beginning Teacher Survey preliminary results are positive, with 94 percent of new teachers in the school systems where support is provided from the CSBT reporting that they are satisfied with teaching as a career. The strength of the program is coordinated support—a comprehensive formalized program of support for new teachers, mentors, and principals collaboratively planned and implemented by the university and public school systems. Induction activities include system orientation, face-to-face meetings complemented and enhanced by an online network, school-based mentor support, ongoing professional development for mentors, and opportunities for principals to focus on their role in new teacher development. Without a doubt, putting into place a combination of support efforts can make a difference.

For more information about the Center for the Support of Beginning Teachers, contact

Janice Holt, director
223 Killian
828.227.7027
holt@wcu.edu

Johnson, S. M. *Finders and Keepers: Helping New Teachers Survive and Thrive in Our Schools* (2007). Jossey-Bass: San Francisco.

N.C. State Board of Education *N.C. System Level Teacher Turnover: Report to the State Board of Education and the State Superintendent* (2005). Raleigh.

N.C. State Board of Education *Improving Student Achievement through Professional Development: Report to the State Board of Education and the State Superintendent* (2002). Raleigh.

Reiman, A. J., Corbell, K., and Rhomas, E. *New Teacher Support: Report to the UNC Deans' Council on Teacher Education (2007).*

Engineering and Technology Graduate Students Presented Research Results

James Zhang • *Kimmel School*

In June 2008, Jeffrey Marston, Brant Price, and Lingtao Zhang presented their research results at the American Society of Engineering Education annual conference in Pittsburg. These graduate students' efforts have been greatly supported by the Graduate School and the engineering and technology faculty at Western Carolina University.

Since the adoption of the Boyer model of scholarship by WCU, the engineering and technology faculty proposed a new model, **GREAT**, under Boyer to reform engineering and technology graduate education. **GREAT**, standing for Graduate Research, Engagement, Applications, and Teaching, promotes graduate education through all four aspects under Boyer's model of scholarship. Our graduate students' papers share successful experiences in applying Boyer's model to enhance graduate learning. All these peer-reviewed papers have gone through a highly selective and rigorous review process and were presented at the graduate studies division of ASEE.

American Society for Engineering 2008 conference

Presented papers

Zhang, J. Z., et al. *Scholarship Reconsidered and Its Impact on Engineering and Technology Graduate Education* (2008). Proceedings of the 2008 American Society for Engineering Education annual conference and exposition.

Zhang, L. T., Adams, R. D., Zhang, J. Z. *Graduate Learning through Teaching: Design of a DSSS System for Undergraduate Wireless Communications Laboratory* (2008). Proceedings of the 2008 American Society for Engineering Education annual conference and exposition.

Price, B. T., Zhang, J. Z. *Graduate Learning through Research: Human Hand Tremor Detection and Analysis* (2008). Proceedings of the 2008 American Society for Engineering Education annual conference and exposition.

Marston, J., Howell, B., Zhang, J. Z., Clapp, R. *Graduate Learning through Engagement: Experience in Environmental Remote Sensing Station Design* (2008). Proceedings of the 2008 American Society for Engineering Education annual conference and exposition

Institute of Electrical and Electronics Engineers 2008 Midwest Symposium on Circuits and Systems

In August 2008, Brant Price and T. J. Knaga presented their research results at the Institute of Electrical and Electronics Engineers Midwest Symposium on Circuits and Systems in Knoxville, Tennessee. Their paper presents results on the detection of human hand tremors using a recent mathematical model called empirical mode decomposition.

Presented paper

James Z. Zhang, Brant T. Price, Robert D. Adams, Kenneth Burbank, Theodore J. Knaga. *Detection of Involuntary Human Hand Motions Using Empirical Mode Decomposition and Hilbert-Huang Transform.* Paper accepted by the IEEE Midwest Symposium on Circuits and Systems, Knoxville, Tenn., August 11-13, 2008.

International Journal of Modern Engineering 2008 conference

In November 2008, T. J. Knaga, Nayaga Mbitiru, and Lingtao Zhang presented their research results at the 2008 International Journal of Modern Engineering Conference. The topics cover human hand tremor detection, human voice stress identification, and bandwidth allocation method based on fuzzy neural network concepts.

Presented papers

James Z. Zhang, Brant T. Price, Robert D. Adams, Kenneth Burbank, Theodore J. Knaga. *Hand Tremor Detection via Adaptive Empirical Mode Decomposition and Hilbert-Huang Transform*. Paper accepted by the International Journal of Modern Engineering Conference, Nashville, Tenn., November 2008. Paper accepted by the IEEE Midwest Symposium on Circuits and System, Knoxville, Tenn., August 11-13, 2008.

Nyaga Mbitiru, Peter Tay, James Z. Zhang, Robert D. Adams. *Analysis of Stress in Speech Using Empirical Mode Decomposition.* Paper accepted by the International Journal of Modern Engineering Conference, Nashville, Tenn., November 2008.

Lingtao Zhang, James Z. Zhang, Robert Adams, Peter Tay. *A Grey Prediction Based Fuzzy Neutral Network Control System for Dynamic Bandwidth Allocation.* Paper accepted by International Journal of Modern Engineering Conference, Nashville, Tenn., November 2008.

Distance Learning in Engineering Technology:

Celebrating Success and Looking Toward the Future

Aaron Ball • *Kimmel School*

Abstract—Distance education for engineering technology programs continues to face challenges in providing quality instruction equitable to resident on-campus programs. Western Carolina University has sought to ensure the delivery of quality instruction by taking the baccalaureate engineering technology program on-site to regional community colleges. This paper will provide a brief historical overview of the evolution and delivery of technology based programs at Western Carolina University. Program curricula will be presented along with a description of articulation approaches with regional community colleges. Challenges encountered and opportunities for the future will be discussed.

Brief History

Growth as an Institution

Founded in 1889, Western Carolina University first served the Western North Carolina region as a semipublic high school. In 1905 the institution became Cullowhee Normal and Industrial School, whose stated purpose was to train teachers for the North Carolina public schools and prepare workers for careers in industry [1]. During its normal years, the school grew to the equivalent of a junior college. In 1929 the institution was elevated to the baccalaureate level and renamed Western Carolina Teachers College. The addition of graduate degrees led to a further change in name in 1953 to Western Carolina College, and in 1967 the institution was granted full university status [2].

During the mid-1960s, growth in the manufacturing sector of the region created a need for technical and management skills to bridge an expanding gap. In 1965 new and expanded shop and laboratory space and the creation of a Bachelor of Science degree in Industrial Technology enabled the institution to enhance course offerings to educate potential engineers, managers, supervisors, and technicians for employment in the region. A new facility was completed in 1971 that included state-of the art classrooms and labs in graphic arts, drafting, electricity/electronics, construction, metals/welding, machine shop, and environmental safety [3].

Growth in Engineering Technology

Based on steady growth in manufacturing, coupled with the rise in high tech applications, the university established a manufacturing engineering technology curriculum in 1977. The MET curriculum sought and was granted ABET accreditation shortly thereafter. In response to the need for more electronics personnel in the WNC region, a Bachelor of Science degree in electronics engineering technology was approved in 1988. The Department of Industrial Engineering and Technology served the region well for more than twenty years. Graduates with Bachelor of Science degrees in industrial technology, manufacturing engineering technology, electronics engineering technology, and industrial distribution were actively recruited and employed by regional industry. However, in recent years these traditionally strong programs began to experience problems of low enrollment, resource dispersion, and less relevance to industry needs due to a downturn in the manufacturing sector of the economy. This trend resulted, in part, from global economic factors, outsourcing of manufacturing and high tech jobs, and niche competition [4].

In 2002, as a result of regular program assessment, faculty in the Department of Engineering Technology at WCU began to detect a downward trend in enrollment. Faculty and administrators made the decision to develop a new program that would offer traditional core engineering technology courses coupled with courses that broaden the scope of the curriculum through a product development systems approach. The new curriculum would no longer specifically target traditional manufacturing markets, but would focus upon preparing students to respond to the rapidly changing industrial scene. The Bachelor of Science degree in engineering technology is currently preparing students for employment in the rapidly changing manufacturing and public service sector in Western North Carolina.

Keywords:
Distance education, distance learning, engineering technology curriculum, and future directions.

Development of Distance Programs

In the mid-1970s, it became apparent that not all students who needed technical degrees were being served. With the end of the Vietnam war, many veterans were returning to the workforce underprepared. Many had earned educational assistance through the GI Bill. Western Carolina University responded to these nontraditional students with the development of the "in-service" program, a curriculum designed to award the Bachelor of Science degree in industrial technology degree on weekends. That led to the first "distance" program in manufacturing engineering technology in the Morganton/Hickory area of North Carolina in the early 1980s. That program, along with electronics engineering technology, was offered in Asheville, N.C., soon thereafter.

Current Status

Rationale for Distance Learning

Western North Carolina has been particularly hard-hit by layoffs due to the increased globalization of furniture, textiles, heavy metals, and other traditional manufacturing. Industry in Western North Carolina has had to undergo significant changes due to those global economic factors and the subsequent loss of thousands of manufacturing jobs between the years of 1999 and today [5]. In April 2002, North Carolina had the third-highest unemployment rate in the country, and 50,500 fewer people were employed in manufacturing than in 2000 due to plant closings and layoffs, a problem reported as "near crises proportion." [5] In 2002 the total employment in North Carolina decreased by 91,100 jobs [6]. Many counties in Western North Carolina had not experienced such dire economic conditions since the Great Depression [7]. Job loss has continued, and the current unemployment rate

for the 25 counties in Western North Carolina ranges from 3.67 percent to 9 percent. The average for the region is 4.8 percent [8].

The current economic crises, coupled with the university's long-standing commitment to industry in Western North Carolina, led the university's chancellor, Dr. John Bardo, to establish a campuswide mandate for engagement with regional business and industry. Engagement activities should focus on sustaining regional businesses and boosting entrepreneurial startups through innovative and creative projects that develop intellectual capital and technology transfer [9, 10, 11]. Additionally, current research suggests that creative and innovative engagement projects be coupled with student learning to strengthen the competencies of ET graduates [12].

The main vehicle for extending the university's offerings to Western North Carolina's unskilled or underskilled workforce is through the current-distance learning curriculum in engineering technology. After the development of the new on-campus engineering technology curriculum in 2002, a new distance curriculum also emerged. Western Carolina University had built a strong reputation for service to the region's workforce by offering a face-to-face, site-based curriculum since the inception of off-campus offerings in the early 1980s.

Program Components

The current off-site program in engineering technology enables place-bound individuals employed in business, industry, and government-related occupations to pursue their four-year degree through part-time, evening study. The program combines the benefits of the established on-site engineering technology curriculum with the convenience of locations near the students' homes. Instructional delivery is primarily through face-to-face classes supplemented by online components and interactive video. The intent of the degree program is to provide an appropriate educational experience that will qualify graduates for career advancement. Western Carolina currently has three off-campus locations for its Engineering Technology distance program: Asheville, Spindale, and Hickory/Morganton. Incidentally, these locations have been particularly hard-hit by the recent economic downturn.

Applicants to the off-site engineering technology program must have an associate's degree in pre-engineering or an associate's degree of applied science in an engineering technology. The student must complete a total of 124 semester hours of study, including the university's forty-two-hour liberal study component, math and science program requirements, and forty-five hours of upper- and lower-level engineering technology classes. Specific curriculum requirements are listed on page 13.

Liberal studies requirements, 42 hours

May be taken at a local community college.

C1: ENGL I, 3 hours

C1: ENGL II, 3 hours

C2: MATH, 3 hours

C3: Oral communication, 3 hours

C4: Wellness, 3 hours

C5: Science, 3 hours

C5: Science, 3 hours

P1: Social science, 3 hours

P1: Social science, 3 hours

P3: History, 3 hours

P4: Humanities, 3 hours

P5: Fine arts, 3 hours

P6: World cultures, 3 hours

First-year seminar, 3 hours

Program requirements, 19 hours

Trigonometry

Statistics

Calculus

Physics

Chemistry

Transferred lower-level engineering courses, 18 hours

Must include engineering graphics and engineering materials.

Transferred upper-level engineering courses, 12 hours

Must include statics/strength of materials and CAD/3-D modeling.

WCU engineering technology courses, 33 hours

Must complete 11 classes of the following:

ECET 301	(Electrical Systems), 3 hours
ENGL 305	(Technical Writing), 3 hours
ET 331	(Quality Systems), 3 hours
ET 335	(Safety Systems), 3 hours
ET 349	(Rapid Tooling and Prototyping), 3 hours
ET 351	(Engineering Analysis), 3 hours
ET 362	(Engineering Logistics), 3 hours
ET 410	(Advanced 3D Computer Modeling and RP), 3 hours
ET 420	(Polymer Technology), 3 hours
ET 425	(Metrology and Reverse Engineering), 3 hours
ET 436	(Engineering Economic Analysis), 3 hours
ET 441	(Power Transmission Systems), 3 hours
ET 449	(Advanced Rapid Tooling and Prototyping), 3 hours
ET 461	(Engineering Project Management) 3 hours
ET 472	(Integrated Control Systems), 3 hours
ET 478	(Integrated Systems Project), 3 hours

Total, 124 hours

The primary focus of the engineering technology curriculum is on engineered systems with a secondary focus on product development. The revised program should fit the new ABET program criteria by offering a strong core based on traditional ET courses coupled with a broad exposure to technology. The Bachelor of Science degree in engineering technology follows the program criteria for accrediting by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology in the manufacturing engineering technology field. As specified, the program consists of coursework that ensures that graduates have proficiency in materials, prototyping, and modeling. The program is currently accredited under the old MET criteria and will be considered for reaccreditation in 2008 [13].

The Role of the Community College

The role of the local community college is critical to the success of the off-campus engineering technology curriculum at Western Carolina University. Applicants to the off-site engineering technology program must have an Associate of Arts or Associate of Science degree in pre-engineering or an Associate of Applied Science degree in an engineering technology. Additionally, the student will be given credit for eighteen hours of lower level (100-level) engineering technology courses and twelve hours of upper level (200-level) engineering

technology courses that were taken as a component of their two-year engineering technology degree. All of the liberal studies requirements (with the exception of the upper-level requirement) may be taken through the community college system. In addition, all of the program requirements can be taken at the community college as well. The option to take courses locally provides a "win-win" opportunity for both students and the local community college. Students benefit by remaining employed and taking courses at times that best fit their schedules. The community colleges benefit from increased enrollment, which in turn results in increased funding from the state.

There is an alternative to satisfying the forty-two-hour liberal studies requirement at the university. The University of North Carolina system (which includes Western Carolina University) and the North Carolina Community College system have formed a "Comprehensive Articulation Agreement" that greatly improves transfer between community colleges and member institutions of the UNC system. The agreement is based on legislation passed in the 1995 session of the North Carolina General Assembly through House Bill 739 and Senate Bill 1161 [14]. Through this agreement, students from any community college in North Carolina can satisfy the general education requirements for any public university in North Carolina. Students who choose this route must satisfy the following components:

- English composition, 6 hours
- Humanities/fine arts, 9-12 hours
- Social/behavioral sciences, 12 hours
- Natural science/mathematics, 14-20 hours
- Total, 44 hours

In addition to all of the fifty-eight community colleges in North Carolina, a number of North Carolina's independent colleges and universities have signed similar agreements.

The option to take courses locally provides a "win-win" opportunity for both students and the local community college. Students benefit by remaining employed and taking courses at times that best fit their schedules.

Successes, Opportunities, and Challenges

Opportunities Appeal to Students

Recent success of the current curriculum indicates that students are taking advantage of the opportunities that are being provided through the off-campus engineering technology curriculum. In 2004, there were approximately forty-eight students enrolled in off-campus Engineering Technology locations. Today, there are ninety-seven students enrolled off-campus. The program has seen particularly strong growth in the Hickory metro area. One reason for growth in that area is a strong partnership with Catawba Valley Community College and Western Piedmont Community College. WCU and these two colleges have formed transfer agreements, exchanged information and established good relationships between the faculty and administration.

In 2005, another step was taken to form strong partnerships with the community colleges in Western North Carolina. An Articulation Conference was held on the campus of Western Carolina University to strengthen relationships among the partner institutions. At the first conference, seven community colleges were represented with thirty faculty members in attendance. The third annual conference was held in 2007, with twelve colleges represented and forty-five faculty members in attendance. At these conferences, community college faculty were provided an opportunity to review the curriculum and tour the facility. Transfer agreements between the community colleges and the university also were drafted at this time.

Successes and Further Opportunities

The off-campus engineering technology program continues to be successful, and students continue to take advantage of offerings at distance locations. The potential for new students remains high in all areas of Western North Carolina. Success of the current program also hinges on articulation and transfer of the student's two-year degree. This articulation leads to a minimum of courses that need to be taken at the more expensive university. Students can take classes at the community college for $42 per hour as opposed to $81.29 per hour at the university. Potentially, a student would only need to take thirty-three hours of the more expensive classes through the university.

There has been a great deal of satisfaction in graduates of the program. Focus groups and advisory committee feedback indicate that graduates are promoted into engineering and/or engineering management positions as soon as they earn their degrees. Current students also indicate a high degree of satisfaction in the quality of the instructors and the program as a whole. A common reason given for satisfaction is the face-to-face delivery of Western Carolina's curriculum. At present, WCU is the only university in North Carolina to deliver engineering technology at a distance using live professors.

Challenges

Western Carolina University has enjoyed much success in its off-campus engineering technology program. Along with those successes, there have been challenges. One of the major challenges to overcome has been to maintain alignment of the off-campus curriculum with the on-campus curriculum. Considerable progress has been made in offering all of the courses needed for graduation off-campus, but challenges still remain. The availability of tenured or tenure-track professor who are willing to teach off-campus is a continued concern. While most are willing to teach at a distance location (sometimes a 230-mile round trip), on-campus schedules often prevent it. There is also a very limited pool of personnel available for adjunct positions due to lack of experience and a relevant Master of Science degree.

Another major concern is the availability of adequate facilities for laboratory courses taught at a distance. Newly formed partnerships with local industry and community colleges have improved the situation, but it is still necessary to require students to drive to campus for occasional Saturday sessions to complete laboratory requirements in some courses. If fuel prices continue to rise, students will continue to have problems meeting the laboratory requirement.

The program has recognized considerable growth, and the outlook for continued expansion appears strong. While growth is indicative of success, it also presents challenges. Classroom usage at the distance locations is often at or above capacity. Additionally, student service issues are more difficult to resolve due to the large number of students. The program director has ninety-plus students to advise and communicate with on a regular basis. The addition of a faculty associate who could assist with recruiting, advisement, and transcript evaluation would greatly enhance the program.

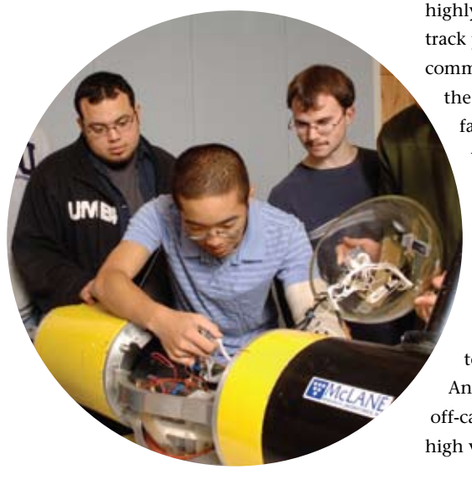
There have been many successes as a result of the off-campus engineering technology curriculum; however, challenges remain that need to be converted into opportunities for improvement. One more such challenge involves the changing needs of the off-campus student. While the on-campus and off-campus curricula are similar, the needs of the on-campus and off-campus population are totally different. On-campus students, at an average

age of 20, have very limited technical knowledge and skills. Typically, off-campus students average 35 years of age, possess a two-year degree in an engineering technology, and have been working in industry for an extended time. The needs of the two groups of students are quite different, and in the future, the two programs should change to meet their needs.

Future Direction

The distance program in engineering technology at Western Carolina University is currently enjoying much success. In order for that success to continue, adequate resources must be committed to sustain and further grow the program. One of the major factors for its success is the personal interaction between advisers/faculty and the students. The face-to-face delivery of instruction by tenured WCU faculty ensures a constant link to the main campus. Students believe they are receiving the same quality instruction as their on-campus counterparts. Advisers regularly schedule visits to their classrooms and maintain regular office hours at each location. In the future, consideration must be given to extend current faculty resources by possible development of online delivery. Some experimentation with Web-based interactive video has been successful. Additional courses in the future will be pursued.

The major challenges described should drive the future direction for the Engineering Technology distance curriculum. The differences in need for the off-campus student versus the on-campus student may indeed require program changes. While the on-campus and off-campus curricula are similar, the students and their needs are much different. Resident students have very limited technical knowledge and skills, while the distance students posses work experience and skills that are highly technical. The difference in need may necessitate an alternate emphasis for the distance program.



Summary and Conclusion

As a part of its mission, Western Carolina University has served the western region of North Carolina since its inception in 1889. In response to significant changes in Western North Carolina's economy on recent years, Western Carolina's commitment to industry and its workforce has never been stronger. The off-campus engineering technology program has doubled its enrollment in the last three years, indicating success but also creating certain challenges.

Successes include a high-quality, face-to-face curriculum taught by highly qualified tenured/tenure-track professors. Western Carolina's commitment to engagement with the region is admirable, and faculty/administrators are to be commended for their contributions toward building a strong distance program. Continued success of the program also is attributed to excellent community college partners who are committed to the success of their graduates. Another factor in the success of the off-campus program is its low cost and high value.

Today's successes provide tomorrow's challenges. In order for the off-campus program to continue to thrive, steps must be taken to ensure that challenges do not become inhibiting problems. Adequate faculty resources will allow the distance program to provide quality instruction to those who need it. In addition, adequate classroom and laboratory facilities will provide safe, high-quality instruction to the deserving place-bound students who cannot commute to campus. Finally, proper program evaluation and assessment will provide information that will serve as impetus for change, if change is truly warranted.

REFERENCES

[1] Western Carolina University. *Cullowhee Normal and Industrial School*, retrieved November 21, 2007, from http://library.wcu.edu/DigitalColl/education/cnis/Index.htm.

[2] Western Carolina University. *The Record*, Cullowhee, N.C., 2004, p. 399.

[3] McDaniel, William L., Aaron K. Ball and Chip W. Ferguson. *Engineering Technology: A Vision for the Future at Western Carolina University* (CD-ROM), proceedings at the American Society for Engineering Education Southeast Section Conference, Chattanooga, Tenn., 2005.

[4] McGraw, D. "My Job Lies Over the Ocean," *ASEE Prism*, Volume 13, Number 4, December 2003, pp. 24 -29.

[5] Klein, Jean C., Chris Beachum and Catherine Moga. "Manufacturing Layoffs: Hard Times for Rural Factories, Workers and Communities," *The Rural Center*, Number 11, April 2002, retrieved November 21, 2007, from http://www.ncruralcenter.org/pubs/mfglayoffs.pdf.

[6] "The North Carolina Rural Economy," *The Rural Center*, Volume 2, Number 2, retrieved November 21, 2007, from http://www.ncruralcenter.org/pubs/ncreconomy.pdf.

[7] "Western Pledges to Help Region," *The Reporter*, Office of Public Relations, Western Carolina University, Cullowhee, N.C., February 2, 2004, p.1.

[8] "Western North Carolina's Economy Trails State's Economic Growth," *Asheville Citizen-Times*, retrieved November 18, 2007, from http://www.citizen-times.com/apps/pbcs.dll/frontpage.

[9] Bardo, John. *Western Carolina University's Commitment to Regional Economic and Community Development*, Rural Economic Development Conference, November 2000, retrieved November 7, 2007, from Western Carolina University, Office of the Chancellor Web site, http://www.wcu.edu/chancellor.

[10] Ibid. *State of the University Address*, January 2004, retrieved November 7, 2007, from Western Carolina University, Office of the Chancellor Web site, http://www.wcu.edu/chancellor/speeches/speeches.htm.

[11] Ibid. *A Regional Summit: Meeting Western North Carolina's Needs through Higher Education*, February 2003, retrieved November 7, 2007, from Western Carolina University, Office of the Chancellor Web site, http://www.wcu.edu/chancellor/Presentations/presentations.htm.

[12] Snellenberger, J. M., D. H. Quick, I. T. Davis, J. P. Tidwell, J. O'Brien, R. M. Haynes, et al. *Enabling the U.S. Engineering Workforce to Perform: Recognizing the Importance of Industrial Engagement In Professional Graduate Engineering Education, American Society for Engineering Education* annual conference and exposition, 2004.

[13] ABET board of directors, *Criteria for Accrediting Engineering Technology Programs*, ABET Inc., Baltimore, November 1, 2003.

[14] University of North Carolina, *Comprehensive Articulation Agreement between the University of North Carolina and the North Carolina Community College System*, retrieved November 21, 2007, from the University of North Carolina Web site, http://intranet.northcarolina.edu/docs/assessment/caa/June%20 2007/102.5_CAA_Modified_Version_Feb_2007.pdf.

A Low-Cost Environmental Test Chamber for Teaching Engineering and Technology Students

Aaron Ball • *Kimmel School*

Abstract—Environmental test chambers are used in a variety of ways in supporting the development of new products and processes and can provide an excellent means to expose students to standardized testing procedures as well as offer opportunities to supplement the teaching of control systems and instrumentation. Using LabView™ for data acquisition and control, a relatively low-cost but effective chamber was developed by Western Carolina University and Asheville-Buncombe Technical Community College through a joint partnership. This paper will present a logical approach to developing such a system and describe how applications have been integrated into curricula at both the two-year and university level. Educational merit and approaches will be described relative to respective educational levels effectively.

Background

Western Carolina University is committed to supporting economic development through scholarly engagement and partnerships. The university established a campuswide mandate for engagement with regional business and industry and has provided for engagement activities that focus on sustaining economic development and boosting entrepreneurial startups through innovative and creative projects, particularly those that develop intellectual capital and technology transfer [Bardo, 1 and 2; Snellenberger, 6]. The development of new products demonstrating significant potential for reducing energy cost coupled with technology transfer resulting in increasing employment in Western North Carolina is of particular concern in light of the significant number of displaced workers in the region [Klein, 3; U.S. Department of Labor, 8].

The Engineering and Technology Department was awarded a contract through the Department of Energy and sponsored by the Education and Research Consortium of the Western Carolinas. Teaming with Asheville-Buncombe Technical Community College, a local manufacturer, and Oak Ridge National Laboratory, a collaborative effort to develop energy efficient technologies for residential water heating was undertaken from 2004 through 2007.

Based on previous work of engineers, scientists, and technologists at Oak Ridge National Laboratory, 18 percent of residential energy utilization is consumed by water heating [Murphy, 4]. Laboratory results have shown the efficiency ratings of test units to be approximately 90 percent of the maximum achievable operating efficiency [Zogg, 9]. Further research conducted by the national laboratory suggested that substantial improvement could be made by implementing a heat pump type unit for supplementing a standard electric water heater. The heat pump water heater, or HPWH, field tests have demonstrated that the overall energy costs of heating water can be reduced by 50 percent [Murphy, 4]. The project discussed in this paper addressed the monitoring, development, and testing needed to prototype a similar product with added dehumidification capability. Thus, the project focused on developing a hybrid water heater and dehumidifier, or WHD, product. Two viable prototypes demonstrating proof of concept were presented as deliverables in Phase I. During Phase II of the project, a controlled environmental test chamber was needed to validate the design and performance prior to field testing. This need led to the development of an environmental test chamber and control system described in the following section.

Environmental Test Chamber and System Design

Companies such as Cincinnati Sub-Zero and Tenney produced commercial environmental chambers with controllers that would have met the technical specifications necessary for the WHD project. However, due to budget and time constraints, alternative options had to be considered.

WCU and A-B Tech worked collaboratively in the development of an environmental test chamber at the A-B Tech WHD laboratory test site. After receiving quotes for test chambers of adequate capacity and size for testing WHD units, the decision to purchase a chamber was abandoned due to costs. A more workable option was identified by relocating and refurbishing a unit previously used by BASF. The BASF facility had recently been transferred to AB-Tech and was located on the A-B Tech Enka campus. This unit consisted of foam-filled panels assembled to form a structure fourteen feet by eight feet by eight feet. Temperature and humidity had been provided by steam piped into the structure from the physical plant; however, no corresponding utilities were available at the AB-Tech WHD laboratory test site.

Keywords:
Instrumentation,
test chamber,
environmental test chamber,
control methods,
and engaged learning.

The foam panels were easily disassembled and reconfigured due to the cam locking mechanism integrated into each unit. It should be noted that these panels are readily available from companies such as CrownTonka, and a quick Internet search revealed numerous eight-foot-by-eight-foot walk-in coolers in the $4,000 through $7,000 price range. Using the panels, faculty and students reconfigured the test chamber into an eight-foot-by-eight-foot-by-eight-foot unit in the Mechanical Engineering Technology Laboratory on A-B Tech's campus. Photographs showing the chamber structure at the AB-Tech laboratory are shown in **Figure 1**.

Figure 1

System Specifications and Redesign

A redesign of both the physical size of the chamber and utilities was required because no steam was available at the new site. Additionally, it was desired to create a system with local control and readily compatible with existing plumbing and electrical utilities.
A conceptual model was initially developed (**Figure 2**), and required systems were identified to meet the testing requirements for WHD prototypes. Load calculations were completed based on the specifications required by the federal test for water heating and dehumidification devices along with the added heat load of the units under test.

Figure 3

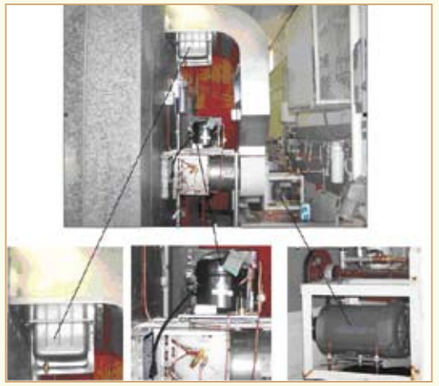
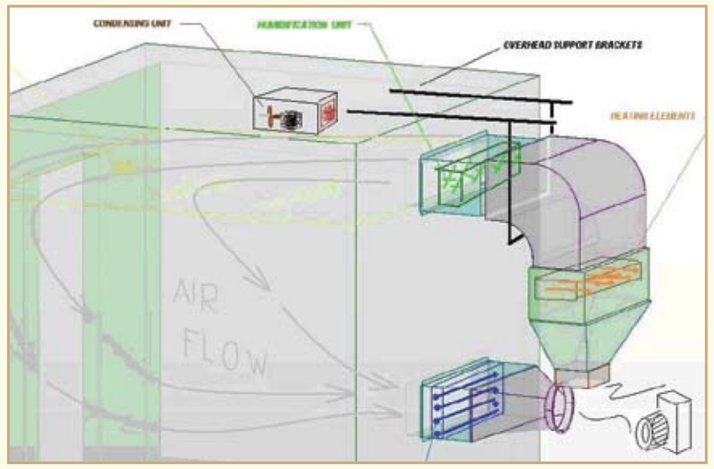


Figure 2



Load Calculations

As summarized by Sigma Systems of San Diego, "The capability of maintaining desired temperature within the chamber was affected by the mass and materials of the unit under test, or UUT, the chamber walls, and components such as blowers and ducting [Sigma Systems, 5]. Further heat-generating capabilities and energy losses must be at a minimum. Energy required to change the temperature of an object can be calculated if the mass and specific heat of the object and the temperature range that the object is subjected are given. From basic thermodynamics, specific heat is defined as the amount of heat required to produce a desired temperature change in an exact amount of any substance and is expressed in J/(^{0}C-g) or BTU/(F-Lbm). The mass of an object is the product of the volume and the density [Sigma Systems, 5].

Heating loads

Heating loads were estimated using the following formulae:

Mass calculation:

Linear mass = ρ x volume
= ρ x (thickness x area)

Energy calculations:

Energy = mass x specific heat x temperature change

Cooling load

Mechanical refrigeration was ideally suited for the chamber because a completely self-contained system could be fabricated using a Copeland condensing unit and an appropriately sized evaporator. Both of these units were readily available from HVAC suppliers and required only electrical connections to operate.

Calculating a Chamber's Cooling Requirements

An environmental test chamber operating below ambient temperature requires refrigeration to compensate for the following factors:

- The heat energy flowing into the chamber through the walls
- The heat generated by lamps, fans and blowers within the chamber
- The heat generated from active loads
- Heat flow through chamber walls can be calculated by the following formula.

Where:

- Q is the heat transfer in BTUs/hour
- A is the total surface area of the test volume in square feet
- Delta T is the maximum required temperature difference
- R is the heat resistance of the insulating material per inch thickness

The cooling load is estimated from the following equation:

Q = A x Delta T / R

Component Selection and Methods of Control

The objective of the environmental chamber project was to satisfy the requirements of testing WHD units and serve as a general purpose testing and teaching facility. Based on estimated load calculations and desired range of environmental control, systems were identified to meet the required specifications for refrigeration, heating, and humidification for the test chamber. The method of control and selected input/output components are shown in the **Table 2**.

A bill of materials is shown in **Table 3**, and selected components were procured and installed as shown in **Figure 3**. Students were involved in all phases of the project, including design, fabrication, and installation under the supervision of faculty. A-B Tech students participated in HVAC system fabrication and testing, electrical controls, and assembly. Graduate students at WCU were responsible for all sheet metal design, layout and fabrication of sheet metal ductwork. Pro-Engineer™ sheet metal module was used to design air ducts, and CNC programs were developed for a HAAS Z-500 laser machining center. Sections of the ducting system were fabricated and assembled on the WCU campus then delivered to the A-B Tech test facility for installation.

LabView™ was selected as the primary method for data acquisition and control due to the capabilities for data acquisition, control and analysis. LabView™ is a sophisticated graphical language very

suitable for science and engineering applications requiring data acquisition, control, and analysis. Further, LabView™ has become more popular with local industries, and a need exists for skills and experience using the software. Primary virtual instruments (VIs) and sub-VIs were written to monitor and control the environmental chamber through feedback control using the constraints as shown in **Table 1**. The developed LabView™ front panel and block diagrams are shown in **Figures 4 and 5**.

Educational Goals

The WHD project presented a challenging opportunity for integrating the development and application of an environmental test chamber into engineering technology courses. Specifically, the educational goals of the WHD project were the professional and technical development of faculty and students, engineering project work for students, and developing laboratory equipment to support research and courses in control systems and instrumentation.

Table 2

Variables, Components and Control Methods		
Output Variable	***Components***	***Control Method***
Heating (40 to 150° F)	Six 750 watt resistance type heating elements	LabVIEW controlled using pulse width modulation. Hardware controlled over-temperature. Shutdown at 150°F.
Cooling (To 40° F)	Refrigeration Unit: 5000 BTU/hr. Condensing Unit: 4800 BTU/hr. Evaporator Unit	LabVIEW on-off compressor control and modulated valve for reduced cooling.
Humidity (20 - 95%)	Steam generator: Steam power with water filter.	Float switch and solenoid valve for water level. LabVIEW on-off control for steam generator and heating element.
Air Flow (0-1090 CFM)	Squirrel cage blower driven by 3-phase motor.	LabVIEW current-loop converter module SCC AO20 to Automation Direct GS2 variable speed drive.
Input Sensors	***Components***	***Data Acquisition Method***
Temperature	J-Type thermocouples	NI-SCC chassis and multiple TC-01 modules. Closed loop control via LabVIEW.
Humidity	Hygrometer with analog port	NI-SCC chassis AI14 input module. Closed loop control via LabVIEW.
Air Flow	Anemometer	Manually adjusted air flow levels to balance system settings.

Table 3

Major Items Purchased to Implement Chamber			
Item	**Supplier**	**Model**	**Price**
Copeland Refrigeration Comdensor Unit	CC Dickson	M2FH-0050-1AA	$1,114
Emerson Evaporator	"		$400
DAQ Module PCI 6221	National Instrument	779066-01	$427
Cable Assembly	"	192061-00	$99
NI SC-2345 Series Shielded Carrier	"	777458-01	$314
Thermocouple SCC-1 module	"	777459-03	$131
2-Channel Isolated Analog Input SCC Module	"	777459-23	$296
Finned Strip Heaters	Omega	OTF 127/120	$408
200' Thermocouple wire w/ overbraid	"	FF-J-20-TCB	$167
Thermocouples (5/PKG.)	"	SA1-J	$60
Temperature Humidity Sensor	"	RH 201A	$695
Variable speed drive 1 HP	Automation Direct	GS2-11PO	$175
Solid state relay		varied	$100
Contactors		varied	$100
Total			**$4,485**

Faculty Involvement

Faculty members from Western Carolina University and Asheville-Buncombe Technical Community College were involved in numerous activities throughout the project. This close partnership was strengthened through total team participation between the two institutions. Although the principal investigator served as project coordinator and community college faculty were initially charged with the responsibility for control development and testing, all faculty were committed to making the project a success. Both institutions freely exchanged support in the form of test site development, instrumentation and control, and testing. As a result of this cooperative team effort, an environmental test chamber was developed to support both research and teaching for both two-year and four-year institutions.

Table 1

ENVIRONMENTAL TEST CHAMBER LOAD CALCULATIONS

HEATING LOAD 150 °F, Ambient 70 °F			COOLING LOAD 40°F Ambient 80 °F	
Static Loads	BTU/hr		Static Loads	BTU/hr
Wall Loss	1536		Wall Loss	768
Ducting Loss	640		Ducting Loss	320
Test Unit	2923		Test Unit	835
Lighting	0		Lighting	136
Dynamic Loads			Dynamic Loads	
Chamber skin	3748		Chamber skin	1874
Test Unit	320		Test Unit	160
Cchmber Air	3072		Chamber Air	1536
Total	12239		Total	6129
Unit Specified	15264	(4300 w)	Unit Specified	8000

General Notes:	Wall area:	384		
	wall skins	gal. steel	22 ga 1.22 lbs/sqft	
	wall insulation	4" polystyrene r 5/in.		
Heating Notes:	skin loss		1536 btus	(150-70)*384(5*4)
	duct area 22 ga ft, r4		640 btus	32*(80/4)
	test unit WH mode		2922.5 btus	assume 7°F/hr, 30 gal/water heat rate
	dynamic load assume span 80°F in 1 hour			
		chamber	3747.84 btus	wall mass 384 sqft * 1.22 lbs/sqft * 1 btu/lb/°F
		test unit	320 btus	40*80* 1btu/lb/°F
		air	3072 btus	.075lb/ft3/in.*512 cuft*80°F
Cooling Notes:	wall skins		768 btus	(80-40)*384(1*4)
	duct loss		320 btus	32*(80/4)
	testunit		835 btus	8.35*50*2 tank cooling rate at max water
	lighting		136.48	40 w * 3.412
	dynamic load assume span 40°F in 1 hour			
		chamber	1873.92	wall mass 384 sqft * 1.22 lbs/sqft * 1btu/lb/°F*40
		test unit	160	40*80* 1btu/lb/°F
		air	1536	.075lb/ft3/in.*512 cuft*40°F

federal tests operate at 60°F minimum reducing loads by 50%, 40°F operation does not include WHD heat

Figure 4

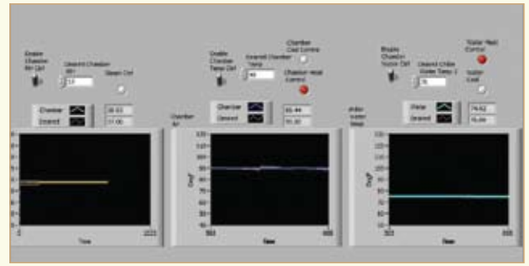
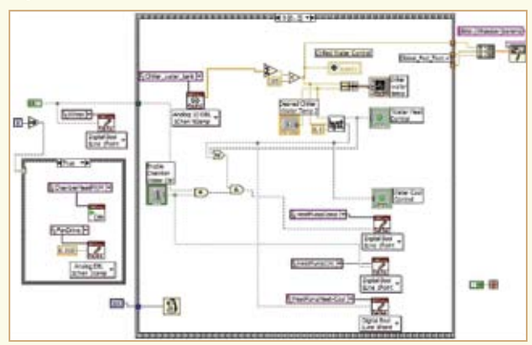


Figure 5



Student Involvement

Snellenberger and his colleagues emphasized the need for students to attain higher technical skills and practical engineering experience to reinforce a stronger U.S. engineering workforce [Snellenberger, 6]. Aside from technical skills, practical engineering experience, and progressive professional skills from industry, advisers often urge that graduates must be made aware of skills such as planning, communications, and safety. The comments from industrial advisory board members have had a major influence on the engineering technology programs. Under their guidance, the curricula for each of the engineering technology programs were designed to provide flexibility and accommodate two general categories of students. For students seeking to transfer for a bachelor's degree, electives in math and science are made available. However, for those students seeking immediate employment with an associate's degree, project classes are recommended to establish workplace experience. Project classes are the college's vehicles for allowing the student to integrate the technical and nontechnical skills. The WHD project, with challenges in many disciplines, was well-suited for this very type of student experience. This project was in essence the experience that the industrial advisory board desired.

Students from both institutions made important contributions and support to the project. Western Carolina University students were primarily involved with engineering documentation and modeling, rapid prototyping, component machining, and sheet metal fabrication. Graduate students also conducted design of experiments and data analysis on UUTs. Two-year college student involvement included site development work, instrumentation, controls, and testing. The follow section provides more specifics on student activities throughout the project.

Use of the Test Chamber to Support an Instrumentation Course

Engineering technology strives to provide students with a balance of theory and applications. Similarly, a balance of instruction in mathematics and sciences fundamentals with practical applications was carried for an undergraduate instrumentation course. Attempts were made to show the operational characteristics of the test chamber by explanations of basic science and engineering fundamentals.

The environmental chamber has proven its value by supporting experiments that are relevant to students' personal and career interests. Recent experiments were conducted relative to sustainable energy by carrying out tests on a hydrogen oxygen generator. Teams were assigned to monitor the gas output of a generator at different electrolyte concentrations. Currently the chamber is being used to validate the efficiency of a new generation of HID and florescent lighting products.

As LabView™ gains more acceptance in the local manufacturing community, more emphasis will be placed on providing necessary skills in LabView™ "G" programming and data acquisition (DAQ). LabView™ instruction is provided throughout the undergraduate instrumentation course, and the chamber provides an opportunity for students to reinforce theory through practical application. Unlike the classroom environment, students set the requirements of the DAQ system and proceed with the implementation using a variety of DAQ hardware and sensors.

Two separate systems are in place for integrating the chamber into the instrumentation class. One system is fixed and used solely for controlling environmental conditions inside the chamber. The second system is used to host students' applications, alloying an individual student to design his or her own application, configure the chamber environment, operate the unit under test, record the desired data, and, finally, analyze the data.

The most recent project for the instrumentation class involved efforts to validate and enhance the capabilities of the environmental test chamber. This was achieved by adding sensors to detect an excessive temperature gradient in the chamber. Students defined inputs, processing requirements and outputs prior to developing a new sub-VI. Five new thermocouples were installed and configured prior to testing the VI and analyzing the effects of chamber performance.

Overall Benefits of the Project

In addition to the educational benefits, a win-win situation has been developed and fostered through the noncompetitive and collaborative efforts of each educational institution. It is widely recognized that technology transfer has the potential to enhance the competitiveness of small businesses, which in turn spurs regional economic development and job growth. As a result of this project, an industrial caliber test chamber is now available to support such initiatives. Additionally, the central missions of Western Carolina University and Asheville-Buncombe Technical Community College have been complemented through efforts in providing new technology and modern engineering support. Oak Ridge National Laboratory gained the potential to expand the body of knowledge and demonstrate concepts of viable alternative energy saving appliances through validated environmental chamber testing.

Conclusion

Western Carolina University and Asheville-Buncombe Technical Community College contributed resources and support for the design, fabrication, and testing of a fully instrumented environmental test chamber. This creative and applied engineering project provided each institution with the opportunity to integrate applications of theoretical concepts into course and laboratory exercises as well as supporting research. The test chamber provides multiple learning and research opportunities for community college students, university undergraduate and graduate students, and faculty from both institutions. Faculty have gained and strengthened their technical knowledge of subjects that may have otherwise remained uncultivated. Further, students were provided opportunities to solve real design problems and gain experience in fabrication, system control, and testing. The knowledge and experience gained will prove to be valuable in the enhancement of engineering technology curricula and support of future engagement projects.

References

[1] Bardo, J. *Western Carolina University's Commitment to Regional Economic and Community Development*. Rural Economic Development Conference, November 2000, retrieved October 17, 2004, from Western Carolina University, Office of the Chancellor Web site at http://www.wcu.edu/chancellor/.

[2] ---. (2003). *Meeting Western North Carolina's Needs through Higher Education*, Regional Summit, February 2003, retrieved October 17, 2004, from Western Carolina University, Office of the Chancellor Web site at http://www.wcu.edu/chancellor/Presentations/presentations.htm.

[3] Klein, Jean C., Chris Beachum, Catherine Moga. "Manufacturing Layoffs: Hard Times for Rural Factories, Workers and Communities," *The Rural Center*, Number 11, April 2002, retrieved November 30, 2004, from http://www.ncruralcenter.org/pubs/mflayoffs.pdf.

[4] Murphy, R. Tomlinson, J. "Field Tests of a 'Drop-In' Residential Heat Pump Water Heater." *Final Report from Oak Ridge National Laboratory, September 2002.*

[5] *Thermal Test Chamber Construction, Considerations and Constraints*, Sigma Systems Incorporated, 2006, retrieved September 2006 from http://www.sigmasystems.com/Techdoc/Chamber%20Size%20Discussion.pdf.

[6] Snellenberger, J. M., D. H. Quick, I. T. Davis, J. P. Tidwell, J. O'Brien, R. M. Haynes, et al. *Enabling the U.S. Engineering Workforce to Perform: Recognizing the Importance of Industrial Engagement In Professional Graduate Engineering Education*, Proceedings of American Society for Engineering Education, 2004.

[7] Taylor, C. "Environmental Test Chamber for the Support of Learning and Teaching in Intelligent Control," *International Journal of Electrical Engineering Education*, 2004.

[8] U.S. Department of Labor, Bureau of Labor Statistics, *Local Area Unemployment Statistic*s, retrieved November 30, 2004, from http://stats.bls.gov/lau/home.htm.

[9] Zogg, R.A. and Murphy, W. J. "California Field-Test Data and Analysis*," Technical Report from the California Energy Commission*, April 2004.

Academic Adventure

Todd Murdock • director, *Educational Talent Search Program*

"Explore, learn, grow" is the tag line for The Educational Talent Search Program at Western Carolina University for good reason.

Students in Western's Educational Talent Search program are going places. The college access program, funded by the U.S. Department of Education, endeavors to increase the number of young people from disadvantaged backgrounds who complete high school and enroll in postsecondary institutions. Only 38 percent of this demographic enroll in college nationally. Talent Search at Western enrolls more than 75 percent of its graduates in programs of postsecondary education.

Over the past few summers, Talent Search has been recognized for its creativity in academic adventure. Students did more than read about Native American tribes in the Great Plains. They flew to Montana, slept in tepees, learned from a 91-year-old hide-tanner, joined tribal children in traditional games and meals, and planted endemic plant species in areas of Glacier National Park damaged by forest fires. During three consecutive summers, participants retraced the Lewis and Clark expedition, hiking, biking and paddling more than 1,400 miles from St. Louis, Missouri., to the coast of Oregon. An environmental and historical-themed "Girl Power" trip to the Carolina coast and barrier islands was an opportunity for many participants to see the ocean for the first time. A five-day bike tour on the Greenbrier River Trail in West Virginia was the platform for teaching leadership skills and group dynamics to high school students this summer. Middle school students spent a few days on Western Carolina's campus this summer doing service projects for area agencies. Students had the dual benefit of participating in community service and living on a college campus for a few days.

An environmental and historical-themed "Girl Power" trip to the Carolina coast and barrier islands was an opportunity for many participants to see the ocean for the first time.

There's a difference between reading or hearing about a place and a people and engaging with them. Building relationships with folks who are experts in a subject or culture adds a striking dimension to the facts and the history and, therefore, to one's understanding. This kind of experiential education is a hallmark for the Talent Search program here at WCU. Helping students understand the world a little better while discovering something new about themselves in the process is a remarkable life lesson.

Talent Search programs are designed to help students explore, learn and grow. The programs are meaningful, powerful, and intentional—a chance to really step outside of one's own world and experience other cultures and places. This is what students from rural Western North Carolina must do to be successfully engaged in college life regardless of where they go to college. There is no reason education can't be vibrant, different, and challenging. "You find out a lot about yourself when you are not in your little bubble of security," said Jessie Nosworthy, a former Talent Search graduate now in her second year at the University of North Carolina at Chapel Hill.

For Monica Gatti, a senior at Nantahala High School who wants to become a teacher, the Montana trip was her first venture west of Tennessee. Gatti said she was moved listening to Oshanee Kenmille—who started tanning hides at age 12 and, at age 14, was wed into an arranged marriage—and inspired when she hiked trails more difficult and longer than she ever had before. "I know it sounds funny, but the sky was really big and open. Everything was. We were driving down the road, and to the left there were rolling hills and to the right Rocky Mountains," said Gatti. "Parts of the trip were challenging, but it was worth it."

Today we listened to a man talk about a dark time in his tribe's past. It was good for the kids to hear, but not necessarily easy to hear. In one story, the man recounted the "kidnapping of the tribe's children by people who were white." At our campfire debriefing tonight, one student said, "I felt sorry for him." Another said, "I felt bad for him." And another, "I think he was just very upset that things didn't work out fairly, like they should have." That was when I knew they got it. They really heard him and were walking a mile in his moccasins.

— Todd Murdock
director, Educational Talent Search Program

Summer enrichment programs are exciting. However, the primary strength of Talent Search services, the aspect most responsible for our high college placement rate, is the work we do every day in the public schools. Students in targeted middle and high schools receive Talent Search's core services throughout the year: college and career exploration, study skills lessons, preparing for the SAT or ACT, fee waivers for tests and college applications, assistance applying for college admission, financial aid, and scholarships.

In the course of their six-year progression through Talent Search, we hope that all the exposure, exploration, and growth—in the classroom and out—helps students make informed choices about their future, which is, after all, the real adventure.

Read more about
Educational Talent Search at

www.wcu.edu/talentsearch

WCU School Of Nursing Launches Nurse Administration Program to Meet the Needs of Western North Carolina

Judy Mallory • *Nursing*

Western Carolina University's School of Nursing is starting a new online master's degree program for nurses who are currently in or moving into management roles in hospitals, public health departments, clinics, and other health care agencies. The program will be the first of its kind in North Carolina to offer a master's degree in nurse administration entirely online.

In addition to a focus on management skills, the new program includes a unique emphasis on preparing graduates to work with medically underserved populations and rural communities. For this online initiative, called Leadership Education for Administration at a Distance, or LEAD, WCU received a three-year, $825,000 federal grant from the Health Resources and Services Administration in the U.S. Department of Health and Human Services.

"Meeting needs is what nursing is all about! From its inception, Western Carolina University's graduate nursing program has been focused on meeting the needs of our community and region."

—Vincent Hall
director,
WCU School of Nursing

This program will prepare nurse leaders using the LEAD model. This innovative distance-education model for advanced nursing education will provide rural Appalachian and Cherokee (as well as other) nurses the opportunity to obtain a master's degree in nursing administration, enhancing the capacity of health care agencies to provide culturally appropriate and responsive health care. Courses will be provided online, and the program faculty and staff will work with nurses to secure preceptors and mentors in their local areas. This program model will provide a way for nurses without travel time or travel money to access a high-quality educational program specifically designed to assist them in the delivery of culturally and linguistically appropriate services to rural, minority, and medically underserved populations.

"Meeting needs is what nursing is all about! From its inception, Western Carolina University's graduate nursing program has been focused on meeting the needs of our community and region," said Vincent Hall, director of the School of Nursing. WCU's graduate nursing program started with the family nurse practitioner program, or FN program. The faculty identified a need for primary care providers in rural areas. Since its inception in 1999, the FNP program has graduated seventy-four practitioners who are providing care in family practice offices and clinics and a variety of specialty settings, including asthma and allergy, gerontology, gastroenterology, hematology, and pediatrics.

The need for competent nurse administrators is at a premium in today's highly complex, ever-changing health care environment.

The nurse educator program started in 2003 to help meet the critical shortage of nurse educators in Western North Carolina. Graduates from this program are serving as nurse faculty at Asheville-Buncombe Technical Community College, Southwestern Community College, Blue Ridge Community College, Caldwell Community College, Mayland Community College, and Western Carolina University.

The nurse anesthesia program was started in January 2007 to meet a critical shortage of nurse anesthetists in Western North Carolina. The first class of ten students is now starting its final year of education and will graduate in May 2009.

The need for competent nurse administrators is at a premium in today's highly complex, ever-changing health care environment. Functioning in a leadership role in that environment requires the knowledge and skills of an advanced degree. The nursing component is critical in the design, facilitation, and management of health care systems. Forty-seven percent of nurses work in a supervisory or administrative capacity. Yet the percentage of nurses responsible for managing nursing services who have achieved a graduate degree is low (10.5 percent of midlevel managers and 23 percent of top level managers) [National Sample Survey of Registered Nurses, 2000]. Health care delivery systems thus are unable to hire or employ nurse administrators with appropriate educational preparation due to lack of supply in the current workforce. A strong need exists for nurses in administration with master's degrees to serve as nurse executives and administrators.

With the acute nursing shortage, nurse retention and satisfaction are receiving increasing attention from health system administrators and the public in general. The American Organization of Nurse Executives' report on healthy work environments illustrates the important role nurse administrators' play in the development of a culture supportive of nursing practice and quality patient care. "Hospitals increasingly recognize the importance of investing in nursing management leadership capacity. This starts at the very top, with senior management support for visionary, energetic nursing leadership from the

"Because the program will be online, we anticipate serving nurses and populations in geographically and culturally diverse areas. Our unique program emphasis on culturally and linguistically appropriate services, as defined by the U.S. Office of Minority Health, along with a strong business administration focus, will significantly impact rural and underserved areas of the nation..."

— Judy Mallory
associate director,
School of Nursing

senior level down, to clinical directors and especially unit-level managers, now widely regarded as the hospital's 'chief retention officers,'" said Hall.

In addition to a focus on management skills, the new program includes a unique emphasis on preparing graduates to work with medically underserved and rural populations.

"While nurses in this program are training as administrators, they also will be developing a set of skills that will increase their ability to work effectively with cultural differences among groups such as Cherokee, Hispanic/Latino, rural Appalachian, and increasingly aging populations. We believe this will improve both the quality of service and health outcomes for all patients," said Judy Mallory, associate director of the School of Nursing and grant author.

The need is great for the kind of training LEAD will provide by combining advanced practice concepts and theories in nursing with advanced preparation in business and administration, Mallory said. "We tend to promote people who are good nurses but have no education or training in administration," she said. A recent survey in the Western North Carolina region found that 60 percent of nurses surveyed would be interested in pursuing a master's degree in nurse administration, and the majority of those would like the program offered partially or completely online.

"Similar surveys conducted by WCU and Duke University indicated a strong interest among North Carolina nurses for leadership/management courses at the graduate level. As a result, we anticipate an almost limitless capacity to expand our online LEAD courses once we have developed our faculty and curriculum, chosen clinical sites, and selected and trained preceptors at those sites," Mallory said.

At the same time, the need to address health care disparities is growing. North Carolina is predominantly a rural, medically underserved state, with 99 percent of the state's counties ranked in that category, based on high percentages of minority/underrepresented and uninsured residents, a growing Hispanic population, and a quarter of North Carolina children under 18 living in poverty. "Our LEAD program seeks to improve the overall health of Western North Carolina and reduce the incidence of health disparities by educating nurse administrators with an emphasis on cultural competence, which is a major component in accessibility to health care," Mallory said.

"Because the program will be online, we anticipate serving nurses and populations in geographically and culturally diverse areas. Our unique program emphasis on culturally and linguistically appropriate services, as defined by the U.S. Office of Minority Health, along with a strong business administration focus, will significantly impact rural and underserved areas of the nation. We anticipate our graduates will feel comfortable practicing in rural/underserved areas and will seek employment opportunities in management at these sites upon graduation," Mallory said.

In order to enroll in the new nurse administrator program, students must have earned a Bachelor of Science degree with a GPA of at least 3.0 in their undergraduate courses, achieved acceptable scores on the Graduate Record Exam, completed at least one year of nursing, and be involved in or headed toward administrative responsibilities. Once enrolled part time, students take five semesters of classes, pass a comprehensive exam, and complete a project in a medically underserved community.

For further information, contact

Jessi Shirley
student service manager
828.670.8810, ext. 246
jshirley@.wcu.edu

Apply to the program by going to

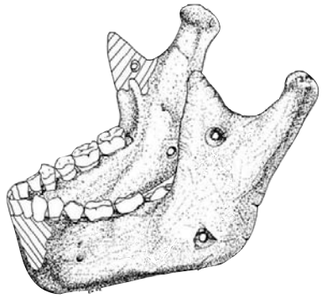
www.wcu.edu/graduate
and then selecting

"Apply Now."

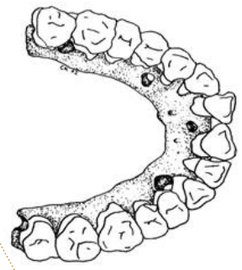
The Ultimate Cold Case:

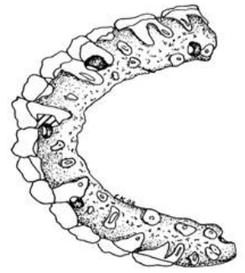
Forensic Anthropologist Sheds Light on 2,000-Year-Old Bones

Cheryl Johnston • *Anthropology and Sociology*



Human remains hold clues to how long an individual's life lasted, which sex the person was, how tall and robust he or she grew to be, and what sort of ancestry the person had.





In October, I will travel to Chillicothe, Ohio, to pick up the skeletal remains of a group of people who lived almost 2,000 years ago. I am a forensic anthropologist in my fourth year at Western Carolina University and have examined thousands of sets of human remains, prehistoric and modern, in the 20 years since I became interested in the things our skeletons can reveal about us. Whether the focus of a skeletal analysis is to determine who a person was and how they died as part of a medico legal investigation or to glean information about past lifeways, there is a lot that can be learned from the human skeleton.

Before joining the faculty at Western Carolina University, I spent nine years as a physical anthropologist at the Ohio Historical Society, or OHS, in Columbus, Ohio. My duties included collecting data on the large collection of human remains curated by OHS. Most of the people whose bones I examined lived centuries or millennia ago, but occasionally, when modern skeletal remains were discovered, a detective or the county coroner would request my expertise. I lead a sort of dual life, taking the knowledge of the human skeleton I accumulated by studying prehistoric remains into the forensic arena in order to reconstruct what I could about a relatively recently deceased person who died under unknown or suspicious circumstances. I also found that things I learned while working on a recently deceased person's skeleton helped me to understand some of the observations I made when I studied a prehistoric skeleton and vice versa.

It wasn't long before I discovered culturally modified human remains in the prehistoric collections at OHS and realized that I had a unique perspective from which to study them. Culturally modified human remains are human skeletal remains that have been worked or intentionally arranged. In other words, they are the result of someone using human bone as a raw material for an artifact or creating a display using human bone. They are often referred to as "trophy skulls" and include skulls, crania, and jaws that have been drilled, ground, incised or shaped in a variety of ways and often, but not always, deposited with interred skeletons or cremations seemingly as a sort of a funerary object. I wondered what I could learn about the people who created these human artifacts and the people from whom they were made by looking at them from the perspective of a forensic anthropologist.

Soon I began to focus on collections of skeletons from the Hopewell Mound Group, with special focus on culturally modified human remains. The Hopewell Mound Group is located in Ross County, Ohio, in the area of south-central Ohio known as the Hopewell heartland, which encompasses several of the "classic" Ohio Hopewell sites. Between approximately 200 B.C. and 400 A.D a cultural phenomenon we call Hopewell thrived in parts of what is now the eastern half of the United States. Hopewell is known for an elaborate material culture and the construction of numerous mounds and earthworks. You may have heard of Hopewell as the "Moundbuilders."

Many facets of human existence during the Middle Woodland period, when Hopewell flourished, have received scholarly attention. Extended discussion regarding the mode of subsistence, living arrangements, ideology, social organization, political structure, and art fills the literature. Researchers have invested many hours describing Hopewell artifacts fashioned from a plethora of raw materials, including chert, copper, hematite, obsidian, pipestone, quartz crystals, cannel coal, mica (obtained in Hopewell times from Western North Carolina), silver, meteoric iron, shell, ceramics, teeth, and bone. Of these categories of raw materials, perhaps the least amount of attention has been focused on bone, especially in cases where human bone has been fashioned into an object or modified by human hands.

The remains I will bring to Western Carolina University in October are from another of the classic Ohio Hopewell sites called Mound City, now owned by the federal government and managed as Hopewell Culture.

National Historical Park by the National Park Service. I was recently invited by the Hopewell Culture National Historical Park to carry out extensive analyses of human remains in its collections as a Southern Appalachian Cooperative Ecosystems Studies Unit project. Native American human remains in museum or federal agency collections are subject to the Native American Graves Protection and Repatriation Act, which is a federal law that sets up a procedure for information-sharing between federally recognized Native American groups and entities that get federal funding and have collections of Native American remains. The law also provides a procedure for repatriation of Native American human remains.

Ultimately, the goal of a bioarchaeological study such as the one I will undertake for Hopewell Culture National Historical Park is to discover something about the breadth and nature of past human variation with the hope that we will learn something about ourselves. Human remains hold clues to how long an individual's life lasted, which sex the person was, how tall and robust he or she grew to be, and what sort of ancestry the person had. Skeletons may also reveal whether certain illnesses or injuries were suffered and in what stage of life these afflictions occurred, whether there were behaviors that were repeated enough to have a physical effect on the body, what sort of diet was used, whether some form of purposeful body alteration was practiced, and whether a woman had ever given birth. My role is to glean all the information I can about the Hopewell and prehistoric Native Americans in general by conducting an array of non-destructive analyses that will address these things as well as how many individuals are represented, how they might be related to other prehistoric groups and to modern groups of Native Americans and what sort of modifications were made to their remains as part of mortuary ritual. Since many of the remains were cremated soon after death, this will be a challenge. Not only is the project focused on Hopewell human remains, which I began studying at OHS fifteen years ago, but the collection from Hopewell Culture National Historical Park includes culturally modified human remains that I haven't had the opportunity to study in depth before.

Law enforcement agencies will likely want to be very involved in the model process, as they were in the Team Charlotte Region project.

Regional Responses to Modern Disasters: *Overcoming Regional Planning Barriers*

Laura Myers and Larry Myers • *Criminology and Criminal Justice*

In 2007-08, researchers Laura and Larry Myers conducted a study in the Charlotte, North Carolina, region to develop and document a model process to assist disaster response planners and stakeholders with regional disaster response planning. The project is currently being implemented in additional communities in the Southeast to further develop the model process. The project is funded by the Department of Homeland Security through its Southeast Region Research Initiative at the Oak Ridge National Laboratory in Oak Ridge, Tennessee.

The model process is a series of collaborative workshops designed to assist teams of disaster response planning stakeholders in their efforts to undertake an ongoing, continuous regional action planning process. The model process can be used by disaster response planners at any point in their regional planning efforts to establish annual regional planning goals and to establish a process that allows them to make progress toward meeting those goals. Regional planning goals can include identifying regional response gaps, developing specialized regional response teams, creating collaborative agency mutual aid agreements to be in place prior to a disaster, and identifying regional "crumbling pillars," which are existing plans and infrastructure believed to be prepared for disaster, but in need of attention because of focus on other issues.

The key to the model process is the communication between disparate planners and stakeholders, such as law enforcement, fire and rescue, the business community, faith-based organizations, and emergency management, each representing different missions in the disaster response process.

The key to the model process is the communication between disparate planners and stakeholders, such as law enforcement, fire and rescue, the business community, faith-based organizations, and emergency management, each representing different missions in the disaster response process. These entities do not typically work together, but in a regional disaster, their collaborations create a more comprehensive and efficient response. Regional action planning benefits from all disaster response efforts that have been established across a region. How those efforts can be combined and enhanced to better allocate resources and provide an effective and efficient regional response to disasters is a product of using the model process. A regional response also permits an improved local response to disasters within regions with regional efforts dispatched to focus on local events, particularly in locations with more needs.

The project has received support from FEMA-NIMS and FEMA Region IV as a method for enhancing regional action planning efforts. The model process developed in this project creates a forum for continuous communication and the development and enhancement of regional action plans that will permit the ongoing compliance with federal, state, and local disaster planning compliance requirements.

The Model Process

The workshop process creates a mechanism for establishing a baseline for regional action planning. Disaster planners determine the current baseline of regional action planning in their area as a starting point for using this workshop process. In the Charlotte pilot study, disaster planning stakeholders met to determine the current status of their regional planning efforts. During the first year of the project, they gathered information and worked toward meeting regional planning goals in regard to integrating faith-based organizations and their resources into the planning process, understanding what the Department of Homeland Security expects from regions and their regional planning efforts, how to better develop multi-state planning when a region crosses a state line, and how to start developing and grooming future disaster planners with the knowledge and focus needed for regional and local planning efforts.

Teams using the workshop process establish a timeline for regional planning goals to be achieved over time. The disaster planners and stakeholders (regional team) establish a set of goals and a timeline to achieve those goals over a continuous timeframe. A series of three to five workshops per year, along with small focus group meetings, permit the planners to develop and refine action plans to work toward and achieve their regional action planning goals. In the second year of the study, the Charlotte team has set additional goals and a timeline for completion. One of its newest goals is to establish a regional volunteer/faith-based resource network for disaster response. This network will permit emergency management officials to tap into the resources of faith-based organizations and volunteers across the region in a quick and efficient manner to respond more effectively during a disaster.

Use of the workshop process over time allows for the development of a growing and evolving team of regional planners and subject matter experts. The workshop process permits the original team of planners to grow as the networking process occurs and the regional boundaries expand. The Charlotte team and the new teams added in year two of the project comprise planners from various disciplines. The efforts of each team are evolving in unique directions, and each team continues to add planners from new disciplines on a regular basis. A major result of using the model process has been bringing together the public and private sectors in disaster response planning. The business continuity community has played a major role in Charlotte's use of the process.

The model process allows for the inclusion of relevant components in regional disaster planning as these components fit the goals of the planning team and the region. A set of key components for regional disaster response planning are included in this model, many of which will be useful to regional planners during their use of the planning process to develop enhanced action plans. One component

of using the model teaches planners that a regional disaster planning process in a community can be facilitated regardless of what stage of development the regional planning process begins. The impact of regional disaster planning over time can be measured so that success or progress toward success can be determined.

Using the model process also permits a larger regional geography from which to create a disaster plan. Optimum emergency resource allocation and flexible emergency plans can be created and assessed with this process. Dynamic activity monitoring to ensure activities and decisions that are in compliance with applicable requirements can be created and assessed. The number and type of regional disaster planners, including business, faith-based organizations, and individuals and families can be increased and measured. Improvement of a regional disaster response plan that will permit communities to be better prepared for all types of disasters can be accomplished and assessed.

By collaborating with communities that have already been working toward or have achieved NIMS (federal response standards) compliance, other communities within the region are able to work toward and achieve their own NIMS compliance and any other compliance standards within their goals.

Ongoing Regional Action Planning with the Model Process

At the end of one year of using the model process, what can a team of regional disaster planning stakeholders potentially have accomplished using the model process? The process creates new and/or improved communication between disparate planning stakeholders that might have been limited or nonexistent before this process was implemented. A regional planning process creates the broadening of regional boundaries with the inclusion of more planning stakeholders from neighboring agencies, entities, and jurisdictions who should be part of the regional planning process. The documentation of regional action planning efforts by communities to meet federal and state compliance standards can be created using the model process.

Smaller communities are able to network with larger communities to share resources, develop action plans, and are better prepared for disaster response. By collaborating with communities that have already been working toward or have achieved NIMS (federal response standards) compliance, other communities within the region are able to work toward and achieve their own NIMS compliance and any other compliance standards within their goals. Using the process can lead to the identification and resolution of gaps at the regional level that might not have been identified at the local level or there might have been limited capability to resolve at the local level. Use of the regional action planning process can lead to better regional response plans for large scale disasters. Regional action planning includes exercises to test the efficacy of regional plans.

The model process allows for the inclusion of key decision-makers in the regional action planning process and allows for the increased dissemination of training to enhance regional action planning. Most important, the process allows users to create a set of prioritized goals with a timeline for completion, as well as the ability to assess progress toward those goals. This creates an environment for improved knowledge of assets and better resource allocation using regional boundaries to draw from.

Information sharing is an important element of the model process. Participants from different planning disciplines explain their efforts in disaster response to the other planning disciplines

Year two of the regional emergency planning project is currently under way, with multiple communities developing their regional action planning process in unique and diverse ways while using the model process developed by Myers and Myers. A result of this research has revealed an extreme diversity in regional action planning methods in each of the regions using the model process. This diversity has depended on the planning leadership, resource allocations, and the emergency planning needs of the community. The model process has provided these communities with a mechanism to customize the workshop process to their own unique characteristics and to enhance their regional planning activities to achieve important goals for the emergency response needs of their communities.

The North Shore Cemetery Decoration Tradition and the Great Smoky Mountains National Park

Philip Coyle • *Anthropology and Sociology*

Photos by Mildred Johnson, courtesy of Helen Vance

The decoration of family and community cemeteries is perhaps the most meaningful and beautiful of all Appalachian cultural traditions. Like quilting, cemetery decoration is a way to connect the generations. Like gardening, it ties people to the land and to the seasons. Like mountain music, its haunting aesthetic can make a person weep with tears of sorrow and joy. Indeed, the tradition of decorating cemeteries explicitly includes these and many other mountain traditions within a singular event. Decoration days combine music, food, art, crafts, and prayer, all mobilized in a way to tie the generations together and connect them to their land and history in a powerfully compelling way.

In 2005 Alan Jabbour, the founding director of the American Folklife Center, was contracted to complete what is called a "traditional cultural property" study of the cemetery decoration tradition associated with the North Shore area of the Great Smoky Mountains National Park. This study was part of the environmental review that was required prior to construction of a possible North Shore Road that would have completed a section that is referred to locally as the "Road to Nowhere."

The North Shore Cemetery decoration tradition has its roots in the communities located along the Little Tennessee River and its tributaries before the construction of Fontana Dam and the establishment of the Great Smoky Mountains National Park.

Along with Alan's wife, Karen, who served as the team's photographer, and cultural resource specialist Paul Webb, who had completed a previous study of the area, I was contracted. Together we produced a report that highlights the significance of the North Shore Cemetery decoration tradition and argues for its fundamental relevance to the history of the Great Smoky Mountain National Park and to the local people of this region.

The North Shore Cemetery decoration tradition has its roots in the communities located along the Little Tennessee River and its tributaries before the construction of Fontana Dam and the establishment of the Great Smoky Mountains National Park. The Fontana Dam was built during World War II to supply power to the aluminum factory in Maryville, and to the then-secret city of Oak Ridge, Tennessee. The graves that were to be flooded were physically excavated and moved to Lauada Cemetery, where they are still very visible next to U.S. 19 near its junction with N.C. 28.

On the other hand, many graves above the waterline on the north side of the Little Tennessee were left in place. As Fontana Dam was being constructed, the Tennessee Valley Authority transferred this land to the National Park Service, and the community members living there were given financial compensation and ordered to leave. Still, the assumption among descendents was that a road would be built along the new "north shore" of Fontana Lake to replace one that had been flooded so that they might continue to access their family cemeteries for decoration days.

The North Shore area began to be managed as a "wilderness," and so roadbuilding, or any other activities that took away from the "primeval" character of the area, was discouraged.

Construction on that road began decades later in the 1970s, but was abruptly stopped as a result of changing National Park Service policies. After World War II, National Park Service policy was to create an "around the park" road. In addition to the "Road to Nowhere" section, which ends at a tunnel outside of Bryson City, remnants of this road can be seen in the Cataloochee section of the park and are still used as the now rather incongruously located Foothills Parkway in Tennessee. By the 1970s, however, National Park Service policies responded to a growing environmental movement and to the congressionally mandated Wilderness Act of 1964. The North Shore area began to be managed as a "wilderness," and so roadbuilding, or any other activities that took away from the "primeval" character of the area, was discouraged.

New regulations, such as one against the use of plastic flowers in the park, were met with outrage by a group of descendents. With Sylva's own Helen Vance as their leader, the North Shore Cemetery Association was formed. This group began to organize cemetery decorations, which in the intervening years had been done only by individuals and families. Abandoned cemeteries were revived and documented, and a summer—long schedule of decoration days was established. At the same time that descendents and others continued their political campaign to complete the "Road to Nowhere," cemetery decorators re-established an important variant of what is a regionwide cultural tradition. The park gradually began to acknowledge the ongoing tradition, and even began providing a pontoon boat for descendents to cross the lake in order to access cemeteries, many of which are located in the Hazel Creek area, home to the former logging town of Proctor, North Carolina.

In addition to their rain ponchos and adventurous spirits, participants arrive at the boat dock with musical instruments, Bibles, favorite foods and many, many plastic and silk flowers. After reaching the cemetery, which may take hours and involve not only the boat trip but also a bus shuttle and a long hike, people search out the graves of their ancestors and begin to decorate them with flowers. These graves are mounded, in the old style, rather than covered with mowed grass, as is common today. Flowers are

used to mark the length of the body, which seems to be revealed by the body-shaped mounded dirt. Sometimes a patterned "quilt" of multicolored flowers is used to completely cover the mound. Announcements are made and the musicians and singers among the participants begin to play. Holding an open Bible to the sky a lay preacher "brings the message." More hymns are sung over the decorated graves, creating a communion across the generations. A "dinner on the ground" follows, now held on park-provided picnic tables rather than on the blankets of old. No Michelin four-star restaurant could top this dining experience, which might include chicken and dumplings, deviled eggs, banana pudding, and many other regional delicacies. The boat trip back to the far shore is contemplative. Many descendents are elderly, and even the younger people are tired after such a long, strenuous, and emotionally powerful day. The stalwarts of the tradition may make dozens of these trips each summer. In this way they have been decorating all of the North Shore graves in each of the cemeteries every year for the past several decades.

The results of our project are summarized as Appendix G of the North Shore Road Environmental Impact Statement, which is available on-line at http://www.northshoreroad.info/index.htm. Alan and Karen Jabbour are currently collaborating on a book to be published by the University of North Carolina Press that looks at the cemetery decoration tradition of the North Shore area in relation to other cemetery decoration traditions in the region. Material for this book also forms the basis of an upcoming exhibit at Western Carolina University's Mountain Heritage Center.

Philip E. (Ted) Coyle is an associate professor in anthropology and sociology at Western Carolina University. In addition to his work on the North Shore Cemetery decoration tradition, he has also conducted interviews with local people associated with other sections of the Great Smoky Mountains National Park and the Blue Ridge Parkway.

Holding an open Bible to the sky a lay preacher "brings the message." More hymns are sung over the decorated graves, creating a communion across the generations.

For more information contact:

Graduate School and Research
110 Cordelia Camp Building
Western Carolina University
Cullowhee, NC 28723
828.227.7398
gradsch@email.wcu.edu

For more information, contact

Graduate School and Research
110 Cordelia Camp Building
Western Carolina University
Cullowhee, NC 28723
828.227.7398
gradsch@email.wcu.edu

WESTERNGRAD.COM

Western Carolina University is a University of North Carolina campus and an Equal Opportunity Institution. 45 copies of this public document were printed at a cost of $198.00 or $4.40 each. Office of Public Relations/Publications: March 2009