COLLEGE OF TEXTILES ANNUAL REPORT 2010-2011

Changes in Service Environment

The textile industry's economic health continues to rebound with significant impact on the College of Textiles. The number of hours of service (education, research and industry support) of our TexLabs increased by 33% with total revenues over $230,000. Revenues from our textile extension courses grew by 12% to $944,000. Our research expenditures are up 20% over the previous year to a total of over $6,100,000. Our enrollment remains at record levels with an almost 60% increase since 2004 and an increase in the student credit hours taught by our faculty of 96%, but the number of faculty remains almost the same as five years ago giving us a student-faculty ratio of over 55 to 1 in one program. We continue an unprecedented number of teaching associate faculty, professors in practice and teaching assistants. We must grow full-time tenure-tract faculty to provide the high quality of education we have always provided. Numerous new opportunities convince us that we have an exciting future. The new Forensic Science program has generated over $2.5 million in new grants and remarkable interest from students. Our Textile Protection and Comfort Center with the new Man-In-Simulant-Test lab has generated such demand we shall be doubling the fire chamber test facilities this year. Our Engineering Research Center proposal (joint with College of Engineering) for Safe Adaptive Filters for the Environment was approved by NSF but not yet funded and has generated so much industry interest and support that we have found funding to proceed with the construction of the new laboratories this year.

Major Initiatives and Changes to Programs and Activities

Working closely with College of Design leadership and faculty, we created a new Fashion and Textile Design degree. For many years we have had a design concentration in our Textile Technology degree and for the past ten years we have had the Anni Albers Scholars program where students receive a B.A. in Art & Design, and a B.S. in Textile Technology. The new FTD degree gives students a solid foundation in textile technology, design studies, and a focus in

either textile design or fashion design. We have completed two new studios for this program. Our growing strength in fashion and design has created new opportunities for exciting partnerships. We are creating a new joint program with the Fashion Institute of Technology in New York City where our students will study together at Donghua University's Fashion Institute in Shanghai. Targeted launch of this program is Spring 2012. We are working closely the Poole College of Management and SKEMA to create a new masters degree in Luxury Product Design and Branding where SKEMA and NC State University students would spend the first semester on our campus, the second semester in France, and then have an internship in Europe. Our students would be under the existing Global Innovation Management degree in the Poole College of Management. We have strengthened our nonwovens programs with the addition of two new faculty, the creation of the ERC S.A.F.E. initiative bringing new partnerships with College of Engineering faculty and faculty from NC Central University, the Universities of Minnesota, Illinois-Chicago, Akron European universities, and new growth in Nonwovens Cooperative Research Center members interested in filtration. This summer we start construction of the new six million dollar Partners Lab focused on filtration funded by the university, the Colleges of Engineering and Textiles, and our industry partners. The Nonwovens Institute now funds 37 graduate students, almost all Ph.D. candidates. We have continued to build the Forensics Science Center. With over three million dollars in research funding already and the National Institute of Justice requesting even more work in training forensics specialists, this has become a major priority for our college and the Colleges of Agriculture and Life Sciences and Humanities and Social Sciences. Together with support from five other colleges at NC State University and other U.S. universities we have submitted an $18M proposal for a Forensics Center of Excellence.

Diversity: Initiatives and Progress

The College of Textiles is recognized for its leadership in attracting minority students and remains one of the most diverse on campus in faculty and staff. We are attracting record numbers of international undergraduates and have over 100 international graduate students. Our undergraduate students are now over 70% female and female students have become the majority of graduate students. We continue a focused effort to increase the number of female faculty. This year we added a new female assistant professor and an Asian-American female associate professor.

Instructional Program Advances

The creation of an innovative educational curriculum for a B.S. in Fashion and Textile Design (FTD) described above is a major milestone for the college. An undergraduate course, lab and a graduate course in forensics science were offered for the first time this year. We instituted a new qualifying examination system for the Fiber and Polymer Science Ph.D. this past fall. Our Textile Engineering degree received an outstanding report during the ABET accreditation review. Our Textiles Off-campus Program continues to grow and this year our DE revenues supported four graduate research assistants and five graduate teaching assistants. Our 3+2 program with Donghua University is off to an excellent start with 12 students in the program this year, and 12 students in the program this coming fall.

Research

Table 1 shows a 20% increase ($5.07M → $6.1M) in total research expenditures compared to last year. Our research growth is significant when one considers that in 2006-2007 $2,496,957 of our total was National Textile Center (an earmark) funding. Not counting NTC funding, our research expenditures have grown from $3,438,572 to $5,216,251, a 52% increase. This year's federal grant proposal effort is over $2M not counting our parts of the other $40M in grant applications that include Textiles faculty as co-PIs but are led by other departments. Large proposals led by other departments include one to NIST for $6.5M for scale-up work on carbon nanotube based structures and one to NSF for $10M for a STEP Center for Innovation and

Entrepreneurship. Large proposals from the college are to NSF, DOE, and DTRA. The college also is providing the leadership for an $18M proposal to NIJ for a Forensic Science Institute.

Table 1. Five-year summary of research funding activity in dollars.

	2006-07*	2007-08	2008-09	2009-10	2010-11
C&G Expenditures	5,935,529	6,754,490	5,539,967	5,071,505	6,116,251
Proposals Submitted	31,800,274	18,218,548	13,146,320	28,224,827	27,015,886
Federal (non-NTC)	20,489,769	11,786,214	8,175,443	23,740,163	22,556,885
National Textile Center	2,496,957		970,000	826,422	990,000
Industry	3,456,723	4,126,698	2,611,908	3,117,841	3,168,981
Nonprofit Orgs.	4,312,832	1,216,302	90,000	298,260	300,000
NC State Gov	125,000	318,389	0	0	0

Extension

The Zeis Textiles Extension Education for Economic Development Center established the foundation for continued growth in the future through events for VF, the Southern Textile Association and the new Evolving Textiles conference. Extension staff also filled many of our academic teaching gaps by teaching FTM 491 Fashion Product Quality (23 students in fall, 40 students in spring), TE404/424 (40 students in spring), TE533, (46 students in spring) and Institute of Advanced Analytics JMP and DOE courses (40 students). Textile Fundamentals eLearning users are located in six countries and fifteen states. Approximately 200 College of Textiles students are using our eLearning program as a resource for their academic classes. Texas Woman's University, Cornell, LIM College, the University of Alberta and Western Michigan University incorporated our program into their curricula for fall 2010 and spring 2011. Florida State University and Seattle Pacific University will begin using the eLearning product in

the summer and fall of 2011. TexED served over 900 participants from 30 states and 10 countries in our training workshops with an economic impact exceeding $34M and developed eleven new workshops to meet the needs of industry, many of these in the advanced analytics area. TexED continues to see a more diversified audience in its Textile professional education courses with many participants outside traditional textile disciplines. An example is our expanding support to the U.S. military and agencies of the U.S. government including a special Textiles Fundamentals course for the U.S. Army in Natick, MA. We also taught Lean Six Sigma Green Belt and Black Belt courses to organizations throughout North Carolina as well as in Peru. To date, as part of our licensing agreement with NC Community College System (NCCCS), TexED has supplied the course notes for 22 Lean Six Sigma Green Belt courses led by NCCCS instructors.

Faculty and Staff: Honors, Awards and Recognition

Drs. Russell Gorga and Marian McCord along with Ms. Elizabeth Sharpf of the Harvard Kennedy School shared the 2010 Curry Stone Design Prize and immediately donated the $100,000 prize to Sustainable Health Enterprises (SHE). Dr. McCord was also chosen as the 1st Faculty Star hosted by the Division of Enrollment Management and Services. Dr. David Hinks received the NC State University Outstanding Extension and Outreach Award and was inducted into the Academy of Outstanding Faculty Engaged in Extension. Dr. Cindy Istook received the NC State Alumni Distinguished Undergraduate Professor Award. Professor Fay Gibson received the International Textile and Apparel Association Paper of Distinction. Dr. Kate Carroll received the Triangle Access Award. Dr. Ahmed El-Shafei received the Outstanding Teacher Award for the College of Textiles and became a member of the Academy of Outstanding Teachers. Dr. Blanton Godfrey received a special award from the American Statistical Association Quality and Productivity Conference. Dr. Melissa Pasquinelli's high school research student, Melissa Chan, won the NC International Science Challenge and was one of four finalists representing the U.S. at the Beijing Youth Science Creation Competition.

Dr. Behnam Pourdeyhimi was named NCSU Innovator of the Year, and he also received the Centenary Award of the Textile Institute. Dr. Russell Gorga had over 200 citations to his review article in the *Journal of Composite Materials* and Dr. Sam Hudson now has over 650 citations for his 2004 article in *Progress in Polymer Science*. Mr. Philip Dail was one of three teaching faculty selected by NC State University students as the outstanding teachers of the year.

Students: Honors, Measures of Quality and Student Activities

Eduardo Brasileiro received the 2911 College of Engineering Senior Award for Citizenship and Service. Trinh Doan received the BME Senior Design Team 1st Place Award in biomedical design. Sidney Hill and Mariah Woodruff won NSF Graduate Research Program Fellowships. Our senior design team working under Dr. Warren Jasper took second place at the AIAA regional competition, and they were finalists in NASA's competition with their "Inflated Habitat for Martian Surface and Nanoscale Life Support Catalysis." Angela Hollen won 1st Place, NCSU Entrepreneurship Award. Leigh Hawkins was 1st Place at the ITMA Virginia Jackson Design Competition for Jacquard Woven Design. Jasmine Flood, Chase Kennedy, Kalyn Parker, Shelley Wei and Bryan Bullard all won $5,000 scholarships, paid industry internships, and the celebratory trip to NYS from the Young Menswear Association. Eleanor Hoffman and Stephanie Mejia were selected to present at Charleston Fashion Week. Although much of our enrollment growth has been in the Fashion and Textile Management program, our Polymer and Color Chemistry, Textile Engineering, and Textile Technology programs are also now at record enrollments. Graduates of these programs are in high demand with impressive starting salaries.

Fund Raising

We lost the Executive Director of the NC Textile Foundation to Duke University last November and were missing a director for six months, but we still had an excellent year. We held two major regional alumni events, New York City and Hickory, NC with outstanding attendance at both. We increased funding for the Centennial Scholarships with another endowment and a new pledged endowment. Eight new Centennial Scholars were selected for fall 2011 with

average GPA of 4.72 and 1415 SAT scores. These students are in the top 3% of their high school classes. We now have 114 students (12%) on scholarships. We continued to receive outstanding gifts in kind with an over $3M gifts in Reifenhauser and Truetzschler nonwovens manufacturing equipment and $9M in new software from Lectra with training for our faculty in the FTD and FTM programs. Support from these German and French companies demonstrates our outstanding international reputation.

Administration

Our focus this past year has been in combining positions, reducing administrative staff, and preparing for serious cuts in state funding. Our investments have all been targeted in areas where we can grow research funding, revenues from industry technical service, and increase our revenue-producing extension education programs. We have made major investments in our research labs. We have either created or will have finished by the end of this year 16 new or expanded research labs:

1. New nonwovens pilot plant focused on filtration (approximately $6M investment).
2. New Forensic and Textiles Analytical Lab for Forensic Science Initiative.
3. Anti-microbial Test Facility and Medical Textiles Laboratory.
4. New atmospheric plasma research lab (partnership with ApJET).
5. Nanocomposites and carbon nanotube structures facility.
6. Surface modification and functionalization lab for nonwoven structures.
7. Vapor-phase deposition laboratory for nonwovens research.
8. New composite testing lab to support new Composites Center of Excellence.
9. New extrusion laboratories for tri-component melt-spinning and wet spinning.
10. New Textiles Management Sciences Lab.
11. Addition of new flat-bed cutter to apparel lab.
12. Addition of new narrow fabric weaving machine in weaving lab for medical textiles research.
13. Major expansion of thermal protection labs. A second thermal burn chamber is being added to double capacity due to backlog of work on head, hands, feet as well as body protection.
14. Addition of autoclave for composite structure fabrication.

15. Installation of nine million dollars of new 3D software in Digital Design Lab.
16. Addition of new Erko Truetzschler high-speed nonwoven card in Staple Nonwovens lab bringing total investment in this lab to over $3M.

These labs are being built with a combination of federal grants, industry grants and contracts, discounts, one-time university funding, donations, gifts and interest-free loans.

Recommendations and Concerns for the Future

Major cuts in state funding are creating untenable student-faculty ratios and operations support. The lack of raises for faculty and staff for the past five years are making us vulnerable to poaching by other institutions. This year we lost our foundation executive director to Duke, and our Extension Director and Interim Director to other organizations. The latter two losses jeopardize our ability to continue to generate over $1.2M in extension education and lab service revenues. Hiring the outstanding faculty we need is difficult. We lost two candidates to far better offers from other institutions. Our growth of over 70 percent in undergraduate students in the past six years has created serious challenges on class sizes, faculty assignments, and student support. The growth has not been even across all degree programs and our faculty/student ratios range from 50 /1 to 9 /1 and average over 24 to 1 for the College as a whole. Our most important challenges are having the resources to support our program changes and expanding critical research funding sources. Space is now a major issue and to manage funded expansions of our work in the Textile Protection and Comfort Center and the Nonwovens Institute we are leasing additional space. Opportunities in composites research for aerospace and automotive industries and medical textiles will require significant investments in new facilities, faculty, and graduate students. Environmental and sustainable manufacturing programs will also require new investments. Our focus in the coming year will be seizing the many opportunities we have for revenue growth, but declining state funds will have a major impact on funding graduate students. Non-state funds are not now eligible for the graduate student support plan.

Appendix 1 Examples

Enhance the success of our students through educational innovation.

For the past six years we have provided leadership for the U.S. Department of Commerce and North Carolina Department of Commerce, "Doing Business Internationally" program. This year's focus was on Mexico. Participants included Wake Technical Community College, OTEXA, the U.S. Commercial Foreign Services, and The American Chamber of Commerce. The "Doing Business Internationally" program focuses on international business practices through spring break travel to a foreign country. The experience exposes the student delegates to meetings with international trade specialists and tours of manufacturing facilities as well as immersion into the country's culture. All of our six student delegates were fully funded by corporate sponsors. Planning has begun for the 2012 program, with a focus on Peru and ANDEAN trade.

Enhance Scholarship and Research by Investing in Faculty Infrastructure

The construction of the 16 new or expanded labs described above are an outstanding example of our investment in building faculty research infrastructure. As with almost every one of our labs, these new facilities will enable new teaching opportunities, industry service capabilities, as well as research support.

Enhance Interdisciplinary Scholarship to Address the Grand Challenges of Society

There is no better example of our focus on grand challenges than the proposed Engineering Research Center on Safe Adaptive Filters for the Environment. This approved but not yet funded NSF ERC collaboration with the College of Engineering, four other U.S. universities and several international partners addresses the critical issues of blood safety, water quality and air quality. Although we may not receive NSF funding, we have such strong industry support that we are moving ahead with a $6M investment in new lab facilities and are attracting new members of our Nonwovens Cooperative Research Center interested in filtration.

Enhance Local and Global Engagement through Focused Strategic Partnerships

The College of Textiles is a leader in the field of research and innovation, demonstrated by Dr. Behnam Pourdeyhimi's designation as the NC State University Innovator of the Year and the number of small start-up enterprises that have grown out of our work. These include 3-Tex, HueMetrix, LAAMScience and two in the early stages. Katharos (Dr. Marian McCord) is working to bring a fiber-based dialysis technique to market, and Tec-Cel is focusing on the research of Dr. Xiangwu Zhang to commercialize fiber-based lithium-ion batteries that hold more charge than conventional lithium-ion batteries. A longer charge means you can drive further in your electric car or talk longer on your cell phone between charges. Dr. Zhang also participates in a $49M DOE grant to Celgard in Charlotte to enhance the state's battery materials industry.