

Partnerships, Innovation, and Entrepreneurship

Submitted by

NC State Task Force on Partnerships, Innovation, and Entrepreneurship

The goals and strategies of the NC State Task Force on Partnerships, Innovation, and Entrepreneurship are aligned to help NC State realize one vision: To become and be recognized as the leading model of the land-grant university of the twenty-first century.

- By embracing our land-grant heritage we are expressing a common desire to do work across research, teaching, and service that is useful for ourselves and for others.
- By describing ourselves as a model to inspire others, we are expressing a commitment to raise our aspirations greatly across research, teaching, and service activities.
- By striving to have our leadership recognized, we are not engaging in self-indulgence, but are recognizing that such status increases our attractiveness as a partner and target of investment.

The task force believes that any new model of the land-grant university must be structured around improving sustainability, which we define (following the UN) as meeting the needs of the present without compromising the ability of future generations to meet their own needs, while reconciling the three pillars of sustainability: environment, social, and economic demands.

The task force believes that the appropriate role of a great research university is to be helpful not just within the borders of the state, or even the United States, but everywhere in the world. Sustainability also points to many grand research challenges that reflect the intellectual strengths of NC State, including but not limited to: water, food, energy, security and many other components of health and well-being that NC State can be increasingly well positioned to address.

Goals

The task force elaborates our vision through six broad institutional goals. The subtext of each goal is a commitment to studying, teaching, and helping to create sustainable social and economic development.

Goal 1. Dramatically improve the student experience

When students are admitted and make a commitment to enroll at NC State, they come with big dreams and big expectations. NC State has rich and diverse curricular and extracurricular offerings that can effectively prepare our students to live those dreams. Students have a right to expect to graduate in a reasonable amount of time and emerge as career-ready or graduate-school-ready citizens who are prepared to productively address society's problems and challenges in a diverse and dynamic workplace. A university as large, complex, academically rich, and diverse as NC State clearly has the ingredients to meet those expectations. This richness and complexity, however, is often overwhelming to students. Better structures to integrate the many facets that the university has to offer, including academics, student life, and community engagement (both local and global) could significantly enhance the student experience and better prepare our graduates to pursue their dreams.

Many of the elements to achieve this goal already exist within the fabric of NC State, but they are often disconnected, which limits their ultimate impact and often results in missed opportunities. NC State should create structures to support thematic student communities in order to accomplish the following sub-goals:

1. Build a strong network for students during their tenure at NC State.
2. Help navigate the overwhelming curricular opportunities (beyond the specific requirements of the discipline) in a manner that supports the student's life goals.
3. Provide appropriate channels for experiential learning, research, and community engagement opportunities (new or existing, including international experiences) that align with the community theme.
4. Connect students with professional advising and mentoring opportunities, internal and external to the university, aligned with the community theme.
5. Leverage the highly successful model of living and learning communities as a basis to build upon.
6. Motivate each student to view NC State University as their partner in their educational experience. As such, each college and NC State University will promote learning and life-long learning opportunities via print, on air, and online to include social media (e.g., Facebook, Twitter).

Exemplar

NC State's existing Entrepreneurship Initiative could be built into a structure that supports student success in the thematic area of entrepreneurship; and leverages, connects, and extends NC State's extensive expertise and resources in this thematic area.

Strategies

NC State should establish thematic structures that broadly reflect NC State's mission and strengths, that align with our students' life goals and interests, that are student success focused, and that effectively integrate academics, student life, and community engagement.

1. Build linkages among the curricular opportunities related to entrepreneurship; e.g., Engineering Entrepreneurs Program, The Entrepreneurship Collaborative, the TEC Graduate Certificate, textiles entrepreneurship courses, COM entrepreneurship minor, EI and TEC general education courses, joint COM/EI Entrepreneurship Certificate (proposed), develop GEP thematic track in entrepreneurship.
2. Establish entrepreneurship-themed living-learning program.
3. Build the Phase II Garage to create an entrepreneurially themed "community home" for students (including but not limited to students participating in the living-learning program).
4. Build bridges to the external entrepreneurial community.
5. Expand current entrepreneurial engagement opportunities for students (eGames, Silicon Valley spring break, regional venture pitch competition, entrepreneurial China tour, local tours, lecture series, "fireside chats," etc.)

Metrics

- Percentage of students having experiential learning, research, and community engagement experiences (general)
- Percentage of students in living-learning living villages (general)
- Percentage of students who have an international experience prior to graduation (general)
- Number of students engaged each year in entrepreneurial engagement opportunities (specific to P-I-E)
- Number of students engaged in external entrepreneurial community activities each year (specific to P-I-E)
- Number of students completing courses in innovation and/or entrepreneurship each year (specific to P-I-E)
- Completion of the Entrepreneurship Living and Learning Village and garage (specific to P-I-E)

Goal 2. Embrace and respond to the need for cross-disciplinary research and graduate study

The social challenges to which a contemporary land-grant university should contribute solutions are increasingly both global and local and fundamentally cross-disciplinary. Addressing these grand challenges—which include but are not limited to issues surrounding food, water, energy, health, security, poverty, and quality of life—requires that we undertake research that is essentially cross-disciplinary. We must also produce students who are deeply skilled in at least one discipline but adept at traversing multiple disciplines, learning new skills and perspectives rapidly, and working effectively with diverse teams. Many of the grand social challenges we face can be summed up under the requirement that we learn how to engage effectively in sustainable innovation. Sustainable innovation is a social, economic, political, and ethical imperative for the coming decades. The institutions, communities, innovators, and entrepreneurs that provide leadership in addressing these challenges will generate social and economic development benefits, both locally and far beyond.

NC State is already well positioned to take a leadership role in cross-disciplinary approaches to generating sustainable innovation. Many of the centers and institutes at NC State University are outstanding examples of these cross-disciplinary approaches. These examples include the Engineering Research Center for Future Renewal Electric Energy Distribution and Management Systems Center (FREEDM); the Institute for Advanced Analytics, and the Nonwovens Institute. Moreover, we have strong disciplinary expertise in many of the topical research areas central to the grand social challenges of our times. What we lack are an institutional mandate, supporting structures and processes, and flexibility in the allocation of resources—across disciplines and organizational units—to support a cross-disciplinary reorientation toward addressing grand social challenges.

Proposed and planned exemplars

The Emerging Issues Commons in the new James B. Hunt Jr. Library will provide a unique way to bring people together to address complex, interdisciplinary problems through broad collaboration and engagement. This extraordinary facility will serve as a collaborative space to foster inspiration, understanding, and a willingness to act among citizens from across North Carolina. Reactive LED displays will help focus the energy of interdisciplinary teams toward the pressing issues of the day, and interactive touch walls and digital debate round tables will provide opportunities to pursue new approaches. The commons will also be seamlessly linked to an interactive Web site, allowing students, researchers, and others to work with others from across the state and around the world.

Strategies

The overall strategy is to create cross-disciplinary research collaboratives and graduate fields of study oriented toward grand social challenges. The research collaboratives should aim toward producing the greatest practical degree of inclusive cross-disciplinarity, rather than just obvious synergies between closely related disciplines. The phrases "soup to nuts" and "molecule to market" are appropriate to the degree of cross-disciplinarity we envision. From a practical perspective, both boosterism and critical thinking about potential unintended consequences of attempts to address problems will be essential. The default planning assumption should be that people from every college might find reason to participate in every research collaborative.

Graduate fields of study should aim at creating scholars who are well-grounded in at least one discipline, but adept at crossing disciplinary boundaries now and in the future. It is important to note that fields of study are not the same as degrees and that we must not ignore the importance of maintaining traditional disciplinary labels in some academic and industrial labor markets. We must be concerned both with what our students know how to do and how they are labeled. Finally, each cross-disciplinary initiative will provide opportunities to engage productively with a variety of partners and will also generate opportunities for undergraduate student participation.

1. Create a world-class cross-disciplinary institute for sustainable social and economic development.

2. Create a cross-disciplinary program in innovation studies that will position NC State as the leader in cross-disciplinary research and scholarship, driving new models of creativity, innovation, and entrepreneurship focused on sustainable development.
3. Build a cross-disciplinary Ph.D. program in innovation studies, to include such concentrations as technology management and policy, global supply chain management, entrepreneurship, and sustainable development.
4. Create an array of partnerships to support this effort, including: other research institutions, corporate partners committed to sustainability, funding organizations, community groups, and NGOs.
5. Create administrative and financial structures that will facilitate cross-disciplinary programs achieving university strategic goals.

Metrics

- Successfully launch at least one new research collaborative and one new graduate field of study incorporating cross-disciplinary approaches to grand social challenges in each of the next three years (in some cases, the research collaborative and field of study will be part of the same program).
- Number of active participants from different departments, colleges, partner companies, and other universities.
- Increase total new funding by 50 percent by 2015 using successful funding mechanisms already in place at NC State University and other leading universities to support these new collaboratives and graduate fields of study including: federal grants and contracts, paid memberships, industry grants and contracts, premium tuitions, donations, and royalties and licenses.
- Put in place new research impact measures specific to types of research. Examples in life sciences may be lives saved, diseases eliminated or impact reduced, or people or animals protected through vaccines or other protective measures. Examples in other areas would include jobs created, product or food yield improvements, start-up companies created, royalties and licenses, or publication citations.
- Increase in graduate student and postdoctoral applications in targeted cross-disciplinary fields by 50 percent by 2015.
- Increase percentage of students graduating from cross-disciplinary programs by 50 percent by 2015.

Goal 3. Expand and enhance our tradition of leadership in engagement within and beyond the boundaries of North Carolina by creating opportunities for transformative partnerships, innovation, and entrepreneurship worldwide.

The new model of the land-grant university must be global and built on existing partnerships as well as the addition of new, carefully selected, partnerships that support the strategic goals of the university. Students, both undergraduate and graduate, should have opportunities for international experience including, but not limited to, study abroad, international internships,

and video-enabled multi-national classes and seminars. Our state, national, and international partnerships should be selected to enhance our strengths and fill significant gaps.

NC State is fortunate to have many outstanding programs that attract world leaders as partners. In addition, we are located near what many believe is the world's premier research park. We should create new centers of excellence with RTI, Duke University, and UNC-Chapel Hill, and other private and public universities in the state. We should exploit the potential of the Centennial Campus to attract strategically selected partners to locate R&D facilities and staff on campus. We should seek new partners that enhance our strengths in selected strategic areas.

Exemplars

The existing Engineering Research Center, the FREEDM Center, was created in partnership with six university partners with strong energy research programs and has attracted over forty industry partners. Adding two new, active international university partners and ten global industry partners would further enhance its reputation, funding sources, and impact. The newly approved, but not yet funded, Engineering Research Center, SAFE, can also attract additional international university partners and global industries. A third promised, but not yet created, Center of Excellence for Composites Manufacturing, partnering closely allied with Spirit Aerosystems, can attract numerous aerospace manufacturers, other leading composite research universities (e.g., University of Delaware and Brigham Young University) as well as significant DOD funding.

SKEMA is currently expanding to the Centennial Campus, adding 250 French students to the NC State University environment with new opportunities for the Colleges of Management, Design, and Textiles to create a master's program in luxury apparel and textiles. Similarly, NC State could build on its relationship with Shinshu University and their creation of the Fiber Innovation Incubator to jump-start our Polymer Science Center by partnering with Shinshu, UNC-Charlotte, University of Massachusetts Amherst, University of Southern Mississippi, and other leading polymer science research universities and companies to acquire space in the innovation incubator for cross-disciplinary, cross-university research.

Strategies

1. Create a Forensic Science Center of Excellence with RTI, bringing together faculty and students from six NC State University colleges with leading researchers in RTI and other selected partners (e.g., SBI, FBI, and NIJ).
2. Create the recognized world's leading cross-disciplinary institute for sustainable innovation driving social and economic development.
3. Create new Centers of Excellence with government institutes and agencies (e.g. EPA, NIH), RTI, Duke University, and UNC-Chapel Hill.
4. Support and strengthen Engineering Research Centers (FREEDM and SAFE) by adding strategic partners; securing additional federal, state, and industry funding; adding faculty, post doctoral students and graduate students from multi-disciplinary areas; and attracting new partners to Centennial Campus.

5. Create specific global partnerships in strategic areas by providing lab and office space; exchange agreements for faculty and students; opportunities for jointly funded research; travel funds; and video conference facilities.
6. Support initiatives such as (but not only) Springboard aimed at making NC State University the most attractive place for worldwide partnerships and cross-disciplinary collaborations driving entrepreneurship. This includes going beyond our current attempts to being easier to do business with, to being the easiest and most attractive university to do business and collaborate with for partners that share or can support our goals.
7. Strengthen partnerships with the North Carolina Community College System and the NC State University Extension Services to connect in meaningful ways across all areas of the state. This includes "listening stations" as well as enhancing ways of sharing research and new innovation and entrepreneurship strategies to business and government agencies in every county and the Cherokee Nation.

Metrics

- Successful creation of three new Centers of Excellence through partnerships with RTI, and/or Duke University and UNC-Chapel Hill, incorporating cross-disciplinary approaches to grand social challenges by 2015, with significant federal and state funding.
- Attraction of five new strategically selected partners to create R&D centers to locate on the Centennial Campus or Bio-Centennial Campus in close partnership with multiple departments working on key, multi-disciplinary, goals.
- Creation of five new partnerships with strategically selected international universities, dramatically improving our students' international opportunities and our research collaborations by 2015.
- Ranking within five years as "the easiest university to do business with" by at least one national or international publication.
- Addition of ten strategic partners to each Engineering Research Center and creation of a third Engineering Research Center within the next six years.
- Double the number of qualified transfers from community colleges into degree programs at NC State within five years.

Goal 4. Expand partnerships through connectivity and responsiveness

By focusing resources on the challenges of innovation and economic development, NC State has developed a rich variety of programs and partnerships aimed specifically at building working relationships among academia, industry, and government and fostering an environment of creative innovation. However, these activities historically have not been coordinated and have existed as resource silos—environments that greatly reduce our responsiveness and impact.

Established in 2010, the Chancellor's Innovation Fund is to be used for the development, protection, and advancement of ideas and discoveries assigned to North Carolina State University. This resource will serve as a development mechanism to assist faculty, staff, and students with additional research to further commercial potential of intellectual property disclosed to the Office of Technology Transfer. By identifying promising early state inventions

and supporting further technology development, the Chancellor's Innovation Fund will create outcomes such as new business creation and industry partnerships.

Exemplars

To secure NC State's place as an international leader in research and university-led innovation and to contribute to the economic and social development of North Carolina, NC State has created Springboard, which will act as a virtual and physical network of networks, serving as the catalyst for full integration, collaboration, and cross-linking of the wealth of innovation and entrepreneurship activities at NC State while making the university more valuable and accessible to external partners.

Springboard will serve as the single point of connectivity to facilitate collaboration and partnership among NC State faculty, staff, and students and between the university community and our industry partners. By using tools such as REACH-NC, Springboard will quickly identify innovation resources and points of synergy across campus that bring value to multidisciplinary approaches to addressing grand challenges. In addition, Springboard will serve as a conduit for industry partners that desire access to the university's innovation and entrepreneurship capabilities. Springboard will bring to bear the range of partnering opportunities and increase the value proposition associated with university-industry collaboration. Through Springboard, external partners can maximize the growth potential of their business by identifying and accessing the university's vast resources, including subject matter experts, new technologies, state-of-the art facilities, and student and alumni talent.

Strategies

1. Provide a single, comprehensive point-of-entry for internal and external engagement and collaboration (Springboard Partnership Concierge Office).
2. Serve as a strategic, structured framework for innovation services, training, and facilities.
3. Catalyze full integration, collaboration, and cross-linking of innovation components.
4. Provide value to faculty, postdoctoral scholars, staff, and students by increasing their competitive advantage in securing research, innovation, and entrepreneurial opportunities and allowing them to carry out more impactful activities.
5. Provide coordinated relationship management, including a "friendly front door" for external stakeholders who want to work with NC State but don't know where to start, and ongoing partnership management of strategic accounts involving cross-university activities to ensure continued success.
6. Streamline processes and points of contact to allow successful and highly professional completion of research and innovation and entrepreneurship objectives and create repeat business with external partners and funders.
7. Create new entrepreneurial pathways for students and faculty who wish to launch social, service, and sustainability companies aimed at unmet market needs.
8. Provide partnership, innovation and entrepreneurship training through workshops, seminars and programs.

Metrics

- Increase sponsored research funding 50 percent by 2015
- Double the number of start-up companies by 2012
- Recognition of the NC State brand as an international leader in university-led innovation with its new model for delivery and framework for the evolving development of Centennial Campus to an "innovation neighborhood."

Goal 5. Create meaningful linkages for innovation with K-12 systems

Investing in K-12 innovation is a priority of the UNC Tomorrow Commission and NC State. By supporting STEM-related programs in the colleges, the leadership role of the Friday Institute, and the STEM Extension Education working group network, we are positioned well in this priority area.

A recent synthesis article (*Science*, 10 August 2010) entitled "Partnerships for STEM Education" by ten NSF program officers focused on reforms needed to reduce the barriers for community-engaged scholarship, to increase STEM faculty engagement with K-12 schools, and to reward such scholarship with promotion and tenure. The NSF Math and Science Partnership (MSP) has funded nearly 100 partnerships between universities (including NC State) and K-12 school systems, to improve K-12 STEM outcomes.

Hundreds of field-based research and engagement projects involving partnerships between universities and K-12 systems reach the same general conclusions:

- Sustained university faculty engagement with K-12 schools needs systematic institutional support, including incentives, recognition, and reward structures, i.e. assigned time, adequate pay, and recognition by promotion and tenure.
- Strong networks, i.e., vertically integrated learning communities, with teaching fellows, and professional development workshops, facilitate problem-solving, knowledge generation, and increased effectiveness of individuals.
- STEM interaction between K-12 teachers and college and university STEM faculty has mutual benefits for all participants in the partnerships.

Exemplar

As one of North Carolina's two land-grant institutions, NC State has a long history of providing high-quality extension programs to the rural, agricultural, and natural resource sectors; to the manufacturing, textiles, and industrial sectors; and to small businesses. An essential ingredient of prior success is the presence in the field of trusted experts, backed up by university-based researchers.

NC State can also build on the success of the five offices of The Science House, Kenan Fellows, and the social studies educational program from CHASS.

Strategies

1. Create a statewide K-12 program focused on STEM disciplines.

2. Develop a broader yet integrated infrastructure aimed at professional development and educational support for K-12 teachers in both urban and rural areas in STEM and other fields of learning.
3. Develop a unified education communication and dissemination strategy through a dedicated Web site, publications, and, in partnership with UNC- TV, programs for teachers.
4. Partner with school districts, the community colleges, the business community, DPI, and the Emerging Issues Forum to host an annual conference on emerging issues in K-12 education.
5. Develop a community needs assessment toolkit focused on K-12 public education that is coupled to strategic planning and offered as a service to public school systems.
6. Assign education extension specialists to the various regions of the state operating from Gateway locations, Cooperative Extension Service offices, or Science House regional offices—their job is to link the resident expertise on campus to local needs and help recruit teachers and students to NC State programs, pre-college through postgraduate.
7. Designate field offices serve as the point of contact for public schools seeking NC State expertise.

Metrics

- Increase teacher retention in STEM subjects by 20 percent by 2015.
- Increase student success in end of course testing in STEM subjects in targeted programs by 25 percent by 2015.
- Improve training and educational programs in STEM subjects at NC State (exact measurement to be developed).
- Increase qualified STEM applications to NC State University by 25 percent by 2015.

Goal 6. Unify NC State's two campuses in a highly visible and effective way

NC State needs a twenty-first century visual icon. Just as the Bell Tower points to the distinguished history of our campus, there should be a highly visible campus marker that points to our future. It should proudly proclaim that NC State is North Carolina's first source in technology innovation. The icon must demonstrate this claim in a tangible and practical way. The iconic marker should be a highly visible showcase of present and future "green" technology by demonstrating a range of practical applications of green energy. It should also serve not only as a picture-postcard showpiece, but as a practical and essential part of the everyday life of the campus.

Since the Centennial Campus was established, it has been a hub of increasing academic and business activity. But the Centennial Campus is physically removed from the Main Campus, making it, in essence, a separate academic locale. For both faculty and students, moving from the main campus to Centennial has proven challenging. Crossing Western Boulevard from one campus to the other is both inconvenient and dangerous. While building a rail system may seem an ideal solution, there may be unexplored advantages to other means of connecting the campuses.

Strategy

Build a unity plaza energy bridge to assist the university community in crossing Western Boulevard. This connection will not just be an elevated footpath from one campus to the other, but will also be a powerful demonstration of NC State's rightful place as North Carolina's first source in technology innovation. An energy plaza bridging over Western Boulevard, the bridge will showcase the use of green energy to address the needs of our campus and the state of North Carolina.

The unity plaza energy bridge will be a high-tech, green-energy method of assisting passage from one campus to the other. To support easy and effective use by pedestrians, skateboarders, bicyclers, and wheelchair users, it will use a combination of ways to cross the high traffic thoroughfare: lift, stairs, ramps, moving walkways, moving platforms, and moving carts. It will contain multiple inter-connecting walkways and thoroughfares, and will contain both open-air and covered walkways. It will contain small shops and pavilions along the way (think bridges of London and Venice).

The bridge will generate its own energy by the use of solar panels, speed bumps that generate energy, magnetic induction from steel frame cars moving through the tunnel, wind from cars moving hanging panels that produce kinetic energy, pedestrians creating energy by walking on kinetic pathways and moving kinetic obstacles.

The unity plaza energy bridge will be a destination rather than a thoroughfare—a gathering spot and a highly visible "jewel of NC State."

Metrics

- The completion of the connecting plaza
- Number of students using the facilities
- Outside visitors to the plaza
- National recognition of the plaza