

A PLAN FOR A NEW HORIZON

Envisioning Virginia Tech 2012-2018

Introduction

Virginia Tech faces a new horizon defined by fiscal challenges and a wide array of complex global problems. Addressing these issues will require us to build on our strengths and expand our mission as we continue to meet state and federal commitments for research and higher education and provide a superior environment for nurturing the life of the mind.

The future will be characterized by geopolitical and geo-economic transition, an accelerated pace of globalization, and structural shifts caused by technological innovation. Our graduates will face uncertainties that range from security issues and resource scarcities to political instability and social turmoil—challenges that will be embedded in and defined by complex and interdependent systems. We have entered an era of data-driven, networked societies. As technology changes the landscape of the global economy and the practices of businesses and governments, the demand for graduates who possess superior analytical, critical reasoning, and communication skills and excel at abstract and computational thinking continues to grow. Preparing students for this new horizon requires pedagogical models that spark curiosity and foster creativity. These models must be rigorous but not constraining, involving ‘hands-on’ as well as ‘minds-on’ approaches to problem-solving.

The new horizon for research and scholarship will challenge us to build on our strengths as a comprehensive public research university and land-grant institution. We also value our long tradition as one of the nation’s senior military colleges. The new horizon will require us to develop team-driven initiatives within and beyond the university. Such initiatives will enhance the opportunities for our colleges and research institutes to pursue innovative research agendas that address complex problems and allow us to be responsive to new discoveries and technologies.

Fulfilling our mission in an increasingly complex and interdependent world will also require initiatives that create networks that span geographic scales. We will contribute not only to natural resources, agricultural, industrial and community development but also promote local, regional and national security, resilience, health and sustainability.

With this plan, Virginia Tech is positioning itself to further develop a distinctive profile as a progressive and internationally recognized research university. To realize this objective, we will be poised to grow our undergraduate enrollment when sufficient state resources are available while pursuing significant and strategic growth in graduate enrollment. Focusing on growth in graduate enrollment in science, technology, engineering, computational sciences, health sciences, and business- and policy-oriented subjects will provide funding for additional teaching resources, sustain and expand our research portfolio, and provide a broad range of student research experiences. This growth will also facilitate the pursuit of our mission to address significant science, technology, economic development, and social issues.

We will continue to invest in a comprehensive educational portfolio in which the arts, humanities, business and social sciences have an essential role in individual and social transformation; kindling curiosity and creativity; growing intellectual, entrepreneurial, innovative, and managerial capacities; expanding civic and intercultural understanding; and encouraging a commitment to personal, professional, and social responsibility. The integration of the arts into the fabric of our academic programs offers us a unique opportunity to develop distinctive strengths across programs. The integration of business and entrepreneurship with programs in the sciences, engineering, medicine, arts, and humanities creates the opportunity for radical innovation. The emergence of our architecture and design programs as among the best in the world provides a model for the power of transdisciplinary synergy.

Achieving these goals will require the sustained fulfillment of the Commonwealth's base budget adequacy funding model, the continued growth of externally funded research and private support, and the implementation of innovative financial and business practices. It will also require a significant degree of flexibility and innovation on the part of the university in terms of existing university resources and infrastructure. The plan for 2012-2018 is guided by four structuring challenges that have an impact on the entire university. This plan outlines strategies to address these challenges by enhancing research and innovation; fostering the life of the mind of our students, faculty, and staff; and positioning Virginia Tech as a dynamic and distinctive learning community.

Structuring Challenges

The implications of global interdependence

Comprehensive internationalization is becoming an imperative for higher education given the pace of globalization and the flow of people and ideas across geographical borders. To attract international students, research partners, and resources we must continue to focus on raising our profile worldwide by continuing to emphasize quality. It is no longer sufficient to be concerned with how the university compares with other U.S. institutions; we must intensify our focus in the international arena and evaluate how our programs compare with the best programs around the world. We must invest resources systematically over time to elevate programs that can be competitive globally.

As borders dissolve among disciplines and businesses become increasingly international, students should develop intercultural competence in order to function effectively in the global marketplace. Students must have the opportunity for international engagement and experiences such as study abroad as an integrated component of their educational experience. We need to pursue the local-global connections that join our resident international students with domestic students and create a diverse intercultural campus environment. Virginia Tech will also strive to develop a learning community built on the principles of inclusive excellence that shape our overall diversity-related activities.

Our goal is to increase the number of our programs recognized as among the best internationally. To accomplish this goal, we must continue to recruit excellent faculty and staff; be highly selective in choosing foreign universities and organizations for partnerships; and enter into international competitions to test our strengths and competitiveness in a global context.

The needs and challenges of a data-driven society

We live in a data-driven, networked society. Economic, technological, and social progress depend on the development of an analytically-savvy, multi-disciplinary workforce. We must empower our students to be knowledgeable, wise, and effective participants in an increasingly digital age in areas ranging from art to science to civic discourse. The questions that can be asked and the methods and data sets that can be used to solve complex problems involved in society's 'grand challenges' are being fundamentally altered by technology and the information sciences. To be effective in this environment means being able to apply information technology to the task of solving complex

problems, and being able to take advantage of networking, collective intelligence, simulation, data mining, and modeling.

Virginia Tech is committed to a progressive agenda that provides the educational opportunities, computational infrastructure, and learning spaces necessary to prepare students and faculty to excel in this environment. Emphasis will be given to developing core competencies in information literacy and analytical methods. Meanwhile, research and advanced graduate studies will require an increased capacity for data-intensive high-performance computing.

Our goal is to ensure competency in data analysis and computational methods as a component of general education for all students and to continue to invest in developing an appropriate infrastructure for e-learning and high-performance computing.

Security, resilience, health, and sustainability

In the spirit of our mission, [we will contribute to business-, industry-, and policy-relevant research with a focus on multiple dimensions of security, resilience, health, and sustainability](#). These themes will also underpin much of our outreach activities and service learning.

Virginia Tech will contribute to [national and local security through research programs](#) in cybersecurity, food security, and the security of communication systems (such as wireless, networks, and smart grids) essential to future infrastructure needs. We will build on our leadership in the field of resiliency with an emphasis on the interface between science, technology, and policy. Resilience is construed here as the ability of an entity (organization, organism, or system) to prepare and plan for, absorb, recover from or more successfully adapt to actual or potential adverse, disruptive and/or paradigm-shifting events. [Research on resilience](#) involves a broad spectrum of disciplines. Physicists and engineers study the resilience of complex systems; ecologists investigate the nuances of system stability and resilience of ecosystems; while social scientists from organizational theorists to urban planners view resiliency as a key element in understanding and planning for stability in communities of all sizes. At the same time, humanists ranging from philosophers to artists raise and highlight the moral and ethical questions that our country must confront in the coming years.

Our increased capacity in health sciences, with the establishment of the Virginia Tech Carilion Research Institute and the affiliated School of Medicine, represents a significant opportunity to contribute to our mission. Some of the health care professional training and activities will adopt 'one health' approaches in order to cope with global health challenges which will affect the well-being of

humans, animals, and the environment. Virginia Tech will also continue to promote communication, integration, and collaboration among its professional health programs.

In addition to an overall focus on health, the study of the brain and cognitive and behavioral sciences provide multiple high impact opportunities for cross-disciplinary discovery, application, and implementation. From a strategic perspective, an emphasis throughout the university on studying aspects of the mind and the brain offers an opportunity to engage faculty from multiple colleges and institutes and provides an additional way to emphasize the arts and social sciences as a distinctive element of our academic profile. Studying the complex interactions between genomic, environmental, and behavioral factors will require methods that are grounded in high-performance computing and networks capable of moving, processing, and storing enormous volumes of data. Virginia Tech's strengths in computational science and high-performance computing provide us with a unique opportunity to be leaders in this area of health-related research.

Security, resilience, and health, in turn, connect to the larger construct of sustainability. Virginia Tech will leverage existing and emerging strengths in the following areas: energy, materials, and technology; water science, policy, and management; transportation and communication infrastructures; natural resources, ecosystems, and environmental quality; informatics and policy; food and food systems; and sustainable international development. An increased capacity for data-intensive high performance computing—including geographic information systems, visualization, and policy informatics—is crucial to facilitating advanced research in these areas.

Our goal is to establish a distinctive and globally-recognized profile of research and scholarship by building on our existing strengths (for example in bioinformatics, nanotechnology, neuroscience, polymers, transportation, and robotics) and by investing in our emerging strengths in security, resilience, health, and sustainability.

Ensuring quality, innovation, and results

As the university prepares to move into the next decade, we will continue to meet demands for increased productivity and efficiency without sacrificing quality. [We will also manage increasing costs and the pressures caused by our resource constraints.](#) Potential items for exploration include a thorough review of administrative policies and procedures, the administrative leadership structure, resource allocation strategies, and governance procedures.

Virginia Tech will actively evaluate opportunities and, where appropriate, pursue the creation of new subsidiary units, both non-profit and for-profit entities that can diversify our sources of revenue.

These new subsidiary units will have administrative and financial structures that will be responsive to a rapidly changing external environment. One example is the new company, VT IT Assets, which holds all of our fiber optic assets and frequency spectra. Some of these corporations will be linked to Virginia Tech by affiliation agreements; their purpose will be to channel resources back to support core functions of the university.

A final strategy to explore is a year-round academic calendar. To be successful, a year-round operation must be aimed at enhancing academic opportunities, improving facility usage, reducing pressure on overburdened courses by offering more sections in the summer, and providing students with viable options to reduce the time to graduation.

Our goal is to ensure 'quality, innovation, and results' by reviewing our current business practices for opportunities to optimize efficiency, flexibility, and accountability without sacrificing our ability to remain innovative and competitive.

Responding to the Challenges

The learning, discovery, engagement, and foundational domains that provide the framework for our current strategic plan remain highly relevant as we move forward. The sections below reframe these strategies in a modified form to stimulate further progress in response to the structuring challenges.

Research and Innovation

The dizzying pace of change need not be seen as a problem but as an opportunity. We will continue to leverage the creativity and innovation that has always marked our best efforts and contributed the most to developing our reputation. This requires a focused effort on creating and supporting seamless networks where individuals and ideas can meet to spark creativity, collaboration, and innovation.

Translational research

Virginia Tech values research and scholarship that is innovative, collaborative, internationally recognized, and relevant. Much of our research will continue to focus on various dimensions of national and local security; the resiliency of systems, organizations, communities, and ecosystems; the evolving health and medical enterprise; and local, regional, and global sustainability. [An important hallmark of such research is that it is translational, or geared toward practical applications.](#) This term has a long history in medical science and pharmaceutical research, but a translational approach also informs a great deal of research in agriculture, natural resources, engineering and the

policy sciences and an increasing amount of research in biological, behavioral, and social sciences. Adopting a translational focus to research and scholarship builds upon and reinforces the long-standing approach embedded in our mission.

The networked university

Virginia Tech students, faculty, and staff operate in a world where boundaries are becoming increasingly permeable. The world is undergoing significant economic and demographic shifts. In an interconnected—and therefore interdependent—world, [students and faculty members will become increasingly international in orientation](#). The increasingly collaborative nature of research as well as the amplified emphasis on data-sharing at the national and supra-national levels will favor institutions that provide students and faculty with early exposure to the practices that are becoming essential to generating new knowledge.

Our future research investments therefore will be facilitated by the development of strategies to leverage networked collaborations internally as well as with the commercial sector, national laboratories, international partners, government agencies, and other universities. We must reduce administrative barriers to relationships with these entities, whether they are local, national, or international. Building networks and pursuing collaborative opportunities will provide a firm foundation to continue to pursue [excellence in research and scholarship](#). These efforts will create more research opportunities for faculty and students, improve Ph.D. student recruitment, increase Ph.D. production, and enhance our curricular breadth and teaching quality.

Pathways to interdisciplinary success

Virginia Tech will create and support environments for its educational and research programs that support innovative, high quality, and high-impact outcomes. We need to provide appropriate infrastructure, administrative support, opportunities for collaboration, and the time and freedom to create, apply, and communicate new knowledge. The best way to accomplish these goals is to recruit, support, and reward outstanding faculty with strong disciplinary expertise and openness to innovation. [By allowing intra- and interdisciplinary teams to work without unnecessary barriers, we can achieve superior results](#). Strong academic departments in close partnerships with research institutes, centers, and other internal and external partners should continue to provide the intellectual and operational framework to achieve our aspirational goals

Principal strategies

- Increase graduate enrollment toward a target of an additional 1,000 students, mostly at the doctoral level, mostly in science, technology, engineering, mathematics and health sciences (STEM-H), broadly defined .
- Build on our new capacity in the National Capital Region for research into issues of security and resiliency.
- Increase the number of post-doctoral positions in STEM-H research areas.
- Create new academic organizational frameworks – ‘faculties’ – initially in health sciences and in computational/information sciences. These faculties will promote research and graduate education, foster innovative and synergistic interactions among Virginia Tech faculty, assist in setting long-term strategic priorities, and build partnerships with external collaborators in which teams of researchers can compete more effectively for significant levels of external funding.
- Create meaningful partnerships with industry and governments to address critical and complex problems by co-locating researchers and practitioners in ‘living labs,’ user-centric, collaborative systems of research and innovation where users, in partnership with researchers, drive problem formulation and research design.
- As an example of a strategic global investment, develop research programs on energy and critical technologies, informatics, infrastructure, policy and planning at Virginia Tech’s new partnership facility in India.

The Life of the Mind

Inspiring creativity, curiosity, and critical thinking

The Virginia Tech experience seeks to instill the value that learning drives intellectual development, discovery, and engagement. By creating learning environments, programs, and innovative curricula that broaden and deepen students’ knowledge, [Virginia Tech will help students increase their capacity](#) for reasoning and analysis, rational and aesthetic judgment, oral and written communication, and their capacity to identify problems and contribute to their resolution.

Research—broadly conceived to include discovery-based and creative activities—can be a hallmark experience for every Virginia Tech student. As an experiential learning activity that synthesizes knowledge and skills acquired in the classroom, [research provides a unique opportunity for students to contribute to knowledge creation](#). All students can benefit from research experiences such as the collection and analysis of data or connecting a basic research question to the solution of an applied problem or by interpreting art, society, and culture in new and provocative ways. At Virginia Tech, students will analyze, interpret, and synthesize information from a variety of sources; practice

holistic reasoning; improve verbal, visual, and written communications skills; contribute to team efforts; gain global perspective; and enhance self-confidence and preparation for a career and/or post-baccalaureate education. These goals are consistent with our current First Year Experience Quality Enhancement Plan (QEP) and with proposals to develop theme-based strategies for each academic year involving self-awareness, service, mentoring, and leadership. They also align well with the [learning aspirations](#) established by the Division of Student Affairs.

A commitment to research and experiential learning for students requires that we incorporate a diverse and inclusive range of perspectives and resources into undergraduate and graduate courses across all disciplines. We will respect multiple ways of knowing and experiencing phenomena under study. The inclusive excellence framework of the current Diversity Strategic Plan provides a solid foundation upon which we can take action and track progress.

We will expand our ability to attract high quality graduate students by continuing to offer [strong and progressive graduate programs that are appropriately supported](#). This objective also requires us to focus on the quality of the graduate experience beyond disciplinary curricular offerings, including the cultivation of a culture of interdisciplinary collaboration and professional development. We must continue to address the intellectual and social environment for our graduate students through a process of continual improvement of graduate stipends, housing, faculty-student relations, mentoring, and leadership opportunities.

A new vision for undergraduate general education

Each undergraduate should benefit from an education that allows the pursuit of at least one area of study in sufficient depth so that the student meets the intellectual and professional expectations of that discipline. Majors are presumed to meet this requirement. Every major should be responsive to university-wide expectations for integrating diversity, global and international experiences, undergraduate research opportunities, and/or experiential and service learning. Every major already has clearly defined learning outcomes that demonstrate how critical reasoning, analysis, communication, and other skills are achieved. All of these components of a major must be built on a foundation of superior academic advising. In addition, students are expected to learn some aspects of other disciplines as part of a broader general education, and to demonstrate competence in fundamental areas such as computation skills, critical thinking, and written and verbal communication.

Given the dynamic and unpredictable nature of the world in which our students will live, it is important to reexamine the effectiveness of our [general education program](#). We must open ourselves to consider radical changes that will meet these goals, such as supporting specified

combinations of major and minors and encouraging increasing numbers of students to pursue double majors. We should also reexamine what we view as foundational learning expectations for all students. Computational/informatics competency is emerging as a needed skill given the pervasive impact of these approaches on all disciplines. We must strengthen the depth and quality of student experiences while enabling academic programs to sustain core strengths in established and emerging areas of study. Since an effective general education program includes providing strong foundations for the major courses of study while facilitating the integration of a broad base of knowledge, the university will become a leader in providing innovative, creative approaches to general education. To this end Virginia Tech will comprehensively evaluate and modify the current Curriculum for Liberal Education to embrace alternate pathways to a general education, thereby enabling our students to realize their potential as engaged citizens and life-long learners.

E-learning and distance learning

Advances in technology are dramatically reshaping the educational landscape in two important ways—by creating unique opportunities to enhance classroom and online education and expanding the range of essential skills students must acquire to excel in complex and rapidly changing digital and networked environments.

Technological changes and paradigms for learning are moving forward at a remarkable pace. E-learning courses (both synchronous and asynchronous) leverage technology, communication tools, and teaching-learning processes that many students now embrace and expect in their educational experiences.

Virginia Tech remains strongly committed to exploring how to best use technology to improve the quality of education it offers students. Through the development of our online courses we will continue to explore and embrace sound pedagogy through a combination of active and engaged learning with appropriately matched technological tools. The University also remains committed to the goals outlined in the Code of Virginia to expand access to affordable and high-quality education to Commonwealth residents through online education. We will also continue to provide professional development opportunities to ensure faculty members have the skills necessary to use technology to provide meaningful student-to-student and student-to-faculty interaction, active learning opportunities, and timely and constructive feedback.

Developing information literacy, digital fluency, and computational thinking skills will continue to become an increasingly important facet of every student's educational experience at the Virginia Tech. We must empower students to embrace technology to be knowledgeable, wise, and effective participants in digital communities and in areas ranging from art to science to civic discourse.

Students must be provided multiple opportunities to interact meaningfully with technology that sharpens analytical skills and fosters abstract thinking, enables the effective synthesis and manipulation of data, and improves fluency with the computational methods and models that are necessary to solving otherwise intractable problems.

Principal strategies

- Increase undergraduate involvement in [meaningful research experiences and experiential learning opportunities](#) by adopting a 'hands-on, minds-on' philosophy that promotes connecting real-life experience with academic concepts.
- Increase support for international experiences and foreign language competency for undergraduate and graduate students
- Develop ways to integrate computational sciences and skills for managing and analyzing complex data sets across a wide range of disciplines.
- Develop and implement alternate pathways for general education.
- Increase the range of synchronous and asynchronous courses that leverage technological and analytical tools.
- Review the financing, fee structure, staffing, and incentives for teaching and learning through distance education with a view to establishing a progressive profile of offerings.
- Identify opportunities during construction and renovation to create flexible classroom spaces that fully support e-learning components.
- Increase the quality and availability of academic advising from orientation through graduation.

The Virginia Tech Experience

Ut Prosim, That I May Serve, is the essence of the Virginia Tech experience, the guiding principle of our community. It rests upon a bedrock of trust, integrity, tolerance, and compassion. We cannot serve without honoring diversity. We cannot be a vibrant community without promoting caring, inclusiveness, respecting individuality, and valuing the unique contributions of each of our members.

To continue to attract the best students, post-doctoral scholars, faculty and staff, Virginia Tech will continue to implement programs and policies that create the superior research, learning, and workplace environments essential to a vibrant academic institution. We must continue to expand efforts to foster diversity and inclusion. We must explore and expand programs that promote and enhance health and well-being, cultural awareness, and life-long learning. Recognizing the competitiveness of the labor market, we must also continue to expand and improve policies that promote a healthy work-life balance and ensure that we have inspiring learning and workplace

environments. We strive to be known as a place where faculty, staff and students can live, work, and study in dynamic and inclusive spaces.

We must also work toward a sustainable setting by developing a campus-wide willingness and commitment to critically evaluate our practices and embrace new technologies and innovative solutions. This commitment must include extensive engagement and collaboration among students, faculty, staff, and administrators. The University will implement the Climate Action Commitment and Sustainability Plan and ensure ongoing evaluation and critical examination of the University's policies and practices toward ensuring the most effective and sustainable use of our resources, including human, fiscal, and environmental.

Principal strategies

- Pursue quality-of-life initiatives in support of the university as a vibrant, dynamic, and sustainable workplace with physical and cultural environments that promote life-long learning and mind/body wellness.
- Implement the Climate Action Commitment and Sustainability Plan and ensure ongoing evaluation and critical examination of the University's policies and practices toward ensuring the most efficient and sustainable use of our resources.
- Expand efforts to consider the needs of non-traditional students, including veterans.
- Support the academic initiatives of the Inter-institutional Academic Collaborative of the Atlantic Coast Conference (ACCIAC) recognizing the added value of our successful athletics programs to the life of the campus