

# LEGISLATIVE OVERSIGHT COMMISSION ON EDUCATION ACCOUNTABILITY

Senate Finance Committee Room  
September 10, 2012

## Chancellor Skidmore's Report

- Update on Mountain State University
- **THE COLLEGE ADVANTAGE: *Weathering the Economic Storm***  
Report by Georgetown University Center on Education and the Workforce 1

## Chancellor Hill's Report

- Introduction of Dr. Marsha V. Krotseng, President, Bluefield State College
- VISION 2015: The West Virginia Science and Technology Strategic Plan 19



West Virginia  
Higher Education  
Policy Commission





---

**Report to the Legislative Oversight Commission  
on Education Accountability**

**September 10, 2012**

**THE COLLEGE ADVANTAGE:  
*Weathering the Economic Storm***

Report by Georgetown University Center  
on Education and the Workforce





**THE COLLEGE ADVANTAGE:**  
**WEATHERING THE**  
**ECONOMIC**  
**STORM**

EXECUTIVE SUMMARY

**THE COLLEGE ADVANTAGE:  
WEATHERING THE  
ECONOMIC  
STORM**

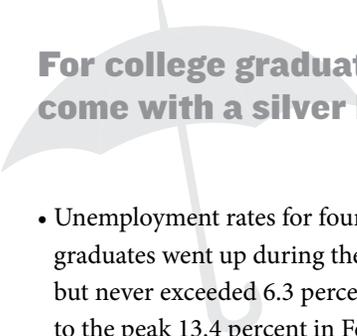
## EXECUTIVE SUMMARY

**W**hen it rains hard enough and long enough, everyone gets a little wet. Economic storms are like that, too. In the Great Recession that began in December 2007, even college graduates lost jobs or ended up in jobs beneath their skill levels. Unemployment and underemployment for new college graduates approached double digits. But college has proved to be the best umbrella in this historic economic storm and the best preparation for the economy that is emerging in recovery. For college graduates, the dark clouds have come with a silver lining.

### **IT IS A TOUGH JOB MARKET FOR COLLEGE GRADUATES BUT FAR WORSE FOR THOSE WITHOUT A COLLEGE EDUCATION.**

Since the recession began, the economy has not been able to create enough jobs for the college-educated labor force, but unemployment rates for college-educated workers have stayed low relative to unemployment rates among those with only a high school diploma or less.

- The unemployment rate for all four-year college graduates is 4.5 percent, but the unemployment rate for recent four-year college graduates is more than 50 percent higher at 6.8 percent.<sup>1</sup> At the same time, unemployment rates for recent high school graduates are near 24 percent.



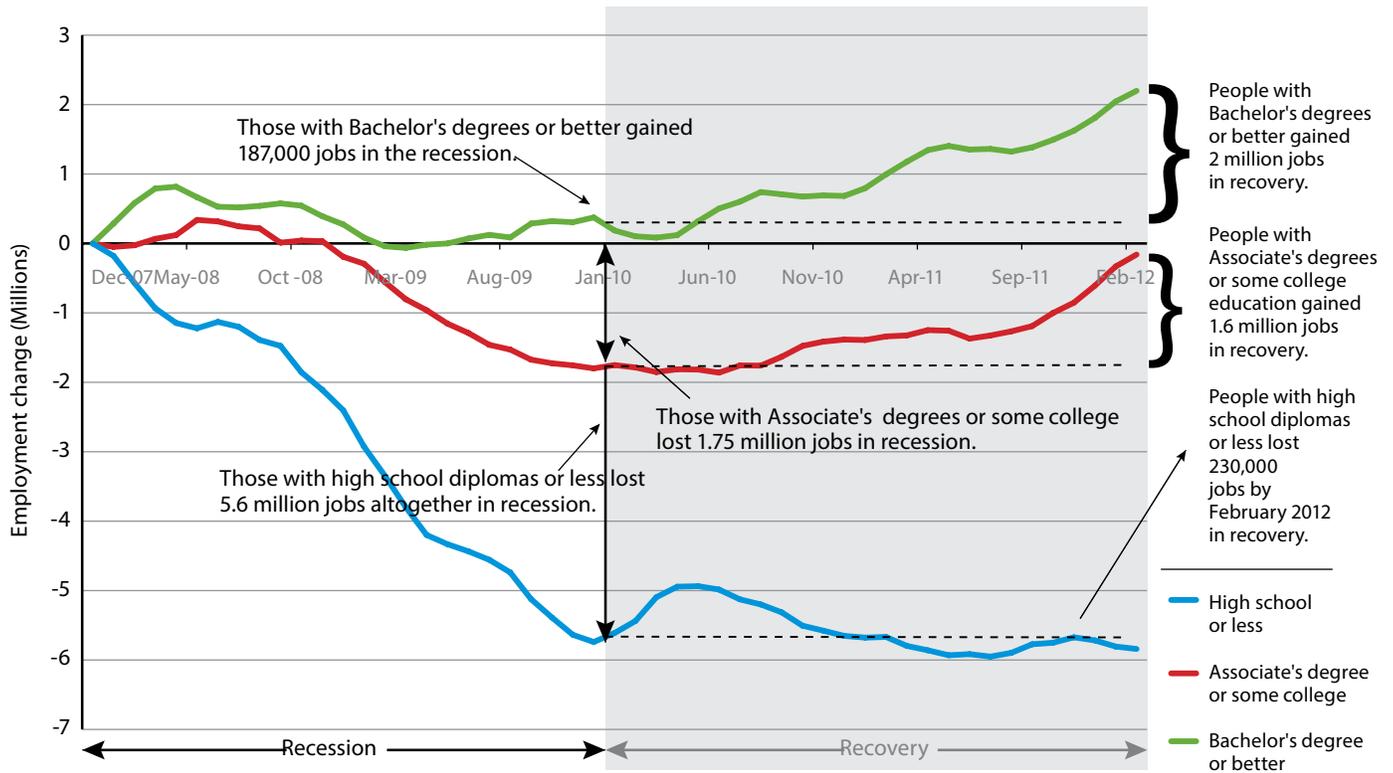
**For college graduates, the dark clouds have come with a silver lining.**

- Unemployment rates for four-year college graduates went up during the recession but never exceeded 6.3 percent, compared to the peak 13.4 percent in February 2010 and the current 9.4 percent unemployment rate for high school graduates.
- Unemployment rates for new four-year college graduates peaked at 11.1 percent in July 2011 before declining to 6.8 percent in May 2012. Meanwhile, unemployment rates for new high school graduates peaked at 30 percent in January 2010 and are still at 24 percent in May 2012.<sup>2</sup>

<sup>1</sup>The unemployment rate for all college graduates is the May unemployment rate from the Current Population Survey (CPS) for those 18 years and older with a Bachelor's degree. The recent college graduates unemployment rate is the May unemployment rate from the Current Population Survey (CPS) for individuals 21 to 25 years of age with a Bachelor's degree. The unemployment rate for recent high school graduates is for 17- to 20-year-old individuals with a high school diploma.

<sup>2</sup>The new four-year college graduates are the Bachelor's degree-holders from age 21 to age 25. The new high school graduates are the 17- to 20-year-old high school graduates. The unemployment rates of the new college graduates and new high school graduates are from the Current Population Survey (CPS).

**FIGURE 1: Workers with high school diplomas or less bore the brunt of the recession's job losses. Job gains in the recovery have been confined to those with education beyond high school.**



Source: Authors' estimate of the Current Population Survey data (2007–2012.) Employment includes all workers aged 18 and older. Note: The monthly employment numbers are seasonally adjusted using the U.S. Census Bureau X-12 procedure and smoothed using four-month moving averages. The graph represents the total employment losses by education since the beginning of the recession in December 2007 to January 2010 and employment gains in recovery from January 2010 to February 2012.

Much the same is true for underemployment.<sup>3</sup>

- The underemployment rate for four-year college graduates is currently (May 2012) at 8.4 percent, but the underemployment rate for high school graduates is more than twice that at 17.3 percent.
- One out of seven new four-year college graduates was underemployed in May 2012. In comparison, nearly half of the new high school graduates were underemployed in 2012.

The most striking statistic shows that nearly 200,000 jobs for workers with at least a Bachelor's degree were added during the recession, and 2 million more jobs for college-educated workers have been added during the recovery (see Figure 1 and Table 1). More than half of the jobs created in the recovery have gone to workers with a Bachelor's degree or better, even though these highly educated workers make up just a little more than a third of the labor force.

<sup>3</sup> The underemployment rates are estimated from the Current Population Survey (CPS). The underemployment rate for all college graduates is the May underemployment rate for those 18 years and older with a Bachelor's degree. The recent college graduates underemployment rate is the May underemployment rate for individuals 21 to 25 years of age with a Bachelor's degree. The underemployment rate for recent high school graduates is for 17- to 20-year-old individuals with a high school diploma. The underemployed include the unemployed, those who are employed part-time for economic reasons, and those who are marginally attached to the labor force. Persons marginally attached to the labor force are those who currently are neither working nor looking for work but indicate that they want and are available for a job and have looked for work sometime in the past 12 months. Persons employed part-time for economic reasons are those who want and are available for full-time work but have had to settle for a part-time schedule.

**TABLE 1: Job gains by individuals with Bachelor’s degrees or better made up for over a third of job losses by those with a high school diploma during recession and recovery.**

Educational Attainment	Job Change			Percent Job Change (%)		
	Recession*	Recovery**	Net Change***	Recession*	Recovery**	Net Change***
High school or less	-5,611,000	-230,000	-5,841,000	-10%	0%	-10%
Some college/Associate’s degree	-1,752,000	1,592,000	-160,000	-4%	4%	0%
Bachelor’s degree or better	187,000	2,012,000	2,199,000	0%	4%	5%
All	-7,176,000	3,374,000	-3,802,000	-5%	2%	-3%

Source: Authors’ estimate of the Current Population Survey data (2007–2012.) Employment includes all workers aged 18 and older.

\* Recession – The period from December 2007 to January 2010.

\*\* Recovery – The period from January 2010 to February 2012.

\*\*\* Net Change – The period from December 2007 to February 2012.

Workers with an Associate’s degree or some college lost 1.75 million jobs because of the recession and have regained 1.6 million jobs in the recovery.

At the same time, workers with a high school education or less lost more than 5.6 million jobs during the recession—and have continued to lose jobs during the slow recovery.

Correspondingly, nearly four out of every five jobs destroyed by the recession were held by workers with a high school diploma or less.

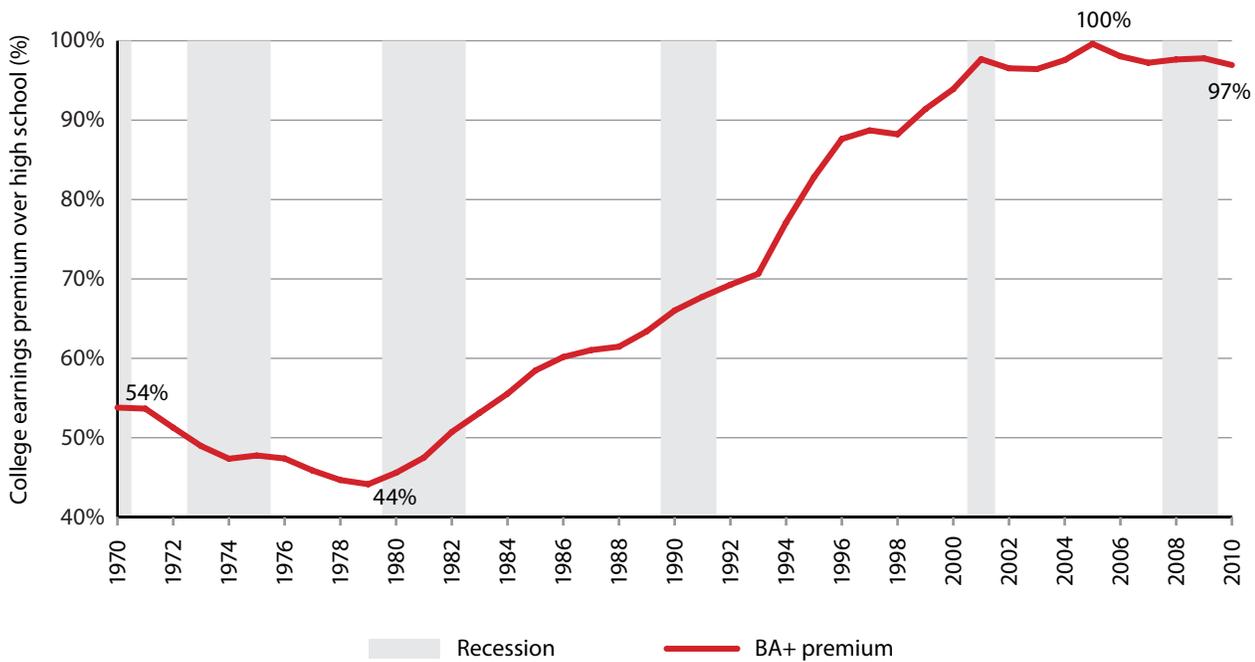
• Even in traditionally blue-collar industries, better educated workers fared better. In manufacturing, employment dropped by 19 percent for workers with a high school diploma or less, but only 9 percent for workers with Bachelor’s degrees or better. In construction, employment dropped by 4 percent for workers with Bachelor’s degrees or better and 24 percent for those with high school diplomas or less.

• In every industry except healthcare services and public administration, workers with high school diplomas or less lost many more jobs than those with more education. Workers with high school diplomas or less lost 4 million more jobs than those with higher education. Healthcare services and public administration added workers with high school diplomas or less through the recession.



**Nearly four out of every five jobs destroyed by the recession were held by workers with a high school diploma or less.**

**FIGURE 2: Earnings of workers with a Bachelor’s degree or better are still nearly twice that of high school-educated workers.**



Source: Authors’ estimate of the March Current Population Survey data (1970–2010). Employment includes all workers aged 18 and older. Note: The estimates are the three-month moving averages of mean earnings of full-time, full-year wage and salary workers ages 25 to 54. The college earnings premium is estimated as the percentage difference between the mean earnings of workers with college degrees or better and the mean earnings of workers with only a high school diploma. The areas shaded in gray represent periods of recession as reported by the National Bureau of Economic Research.

**Earnings of college graduates declined slightly in the recession, but held up during the recovery.**

Earnings of college graduates declined slightly in the recession, but held up during the recovery. Yet, on average, college graduates still earn nearly twice as much as high school graduates.

**THE GREAT RECESSION AND THE GRINDING RECOVERY HAVE NOT BEEN SEX NEUTRAL.**

- Men with Bachelor’s degrees lost nearly 200,000 jobs during the recession, but the number of jobs gained by college-educated women more than made up for those losses.

- Women with a high school diploma or less lost 2 million jobs, while men with a high school diploma or less lost 3.6 million jobs.
- Overall, most of men’s job losses were in blue-collar industries: Two out of every three jobs lost by men were in construction and manufacturing, industries that were hit hard early in the recession. Because of those early losses, men initially lost more jobs than women. Later, when federal financial support for education and state and local jobs began to wane, women lost jobs in accelerating numbers. In addition to job losses in the public sector, women lost jobs in leisure and hospitality, healthcare services, and financial services early in the recovery.

**THE GREAT RECESSION HAS BEEN A COLLEGE WAKE UP CALL FOR MEN.**

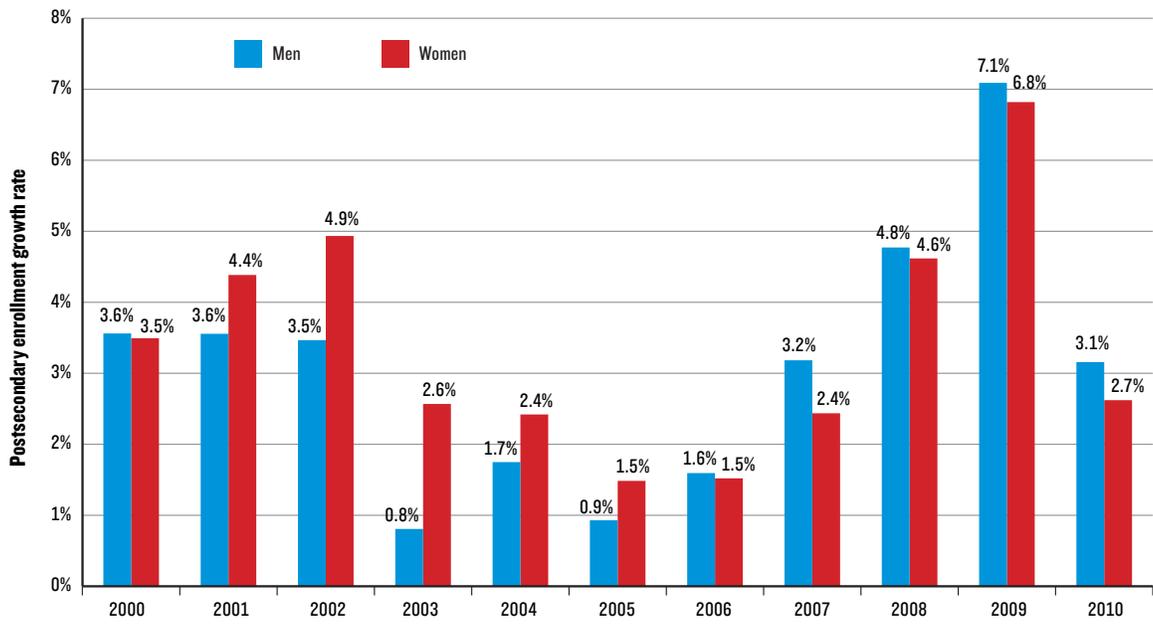
For decades, the economy has allowed young men to skip college—trading long-term wages and benefits for short-term wages. Jobs in the male-dominated blue-collar economy, where good jobs only required high school or less, have been declining since 1979, when manufacturing jobs peaked. The decline in blue-collar male-dominated jobs has been an important cause of the steady decline in wages among jobs available to high school graduates. But these jobs are still a substantial share of employment opportunities, primarily because of job openings due to retirements. The real estate bubble that preceded the economic collapse of 2007 artificially inflated the number of male-dominated jobs in construction. Currently, about one-third of high school graduates can get jobs that will pay an average of \$35,000 a year over a career and these jobs are concentrated in male-dominated occupations. By way of comparison, women get very little labor market traction from high school

diplomas or postsecondary certificates and only get their economic legs underneath them with college degrees.



The Great Recession has produced an economic reckoning for men who stopped their education after high school or before. Men, who in recent decades have lagged behind women in gaining postsecondary education, have been hit harder in the recession and, in response, their enrollment in postsecondary education is now growing faster than women's. Men now realize that they need more than a high school diploma to get a job and that they shouldn't limit themselves to fields dominated by men. They have been flocking to college at greater rates and moving into fields usually dominated by women—such as nursing—that also are more “recession proof” and least likely to be sent overseas.

**FIGURE 3. The postsecondary enrollment growth rate of men exceeded that of women with the beginning of the recession.**



Source: Total fall enrollment in all postsecondary degree-granting institutions is obtained from Digest of Education Statistics 2011, published by the National Center for Education Statistics using Integrated Postsecondary Education Data System (IPEDS) data made available through the U.S. Department of Education ([http://nces.ed.gov/programs/digest/d11/tables/dt11\\_198.asp?referrer=report](http://nces.ed.gov/programs/digest/d11/tables/dt11_198.asp?referrer=report)).

As Figure 3 shows, the enrollment growth among men is much larger this recession than in the 2001 recession. This is likely because men were hurt worse by the more recent recession. As traditionally male low-skill jobs disappear, men need more education to compete in industries that are adding jobs. And gaining an education is exactly what men are doing.

In addition, men are now moving into industries that have traditionally been dominated by women, such as healthcare, for which more postsecondary education or training—often a Bachelor’s degree—is needed to land a good job. In healthcare, for example, only workers with postsecondary education have been able to find jobs in the recovery.

**COLLEGE-EDUCATED WORKERS HAVE MORE THAN SURVIVED THE GREAT RECESSION, THEY HAVE LED THE RECOVERY.**

In the aftermath of the recession, the economic recovery has stagnated, but college-educated workers continue to fare better as more than half of all jobs created have gone to workers with Bachelor’s degrees or better.

So far, the recovery has returned nearly half the number of jobs destroyed by the recession. Workers with an Associate’s degree or some college have recaptured about 91 percent of the jobs they lost. In contrast, those with high school diplomas or less have continued to lose jobs, albeit at a much slower pace.

Those with a Bachelor’s degree or better have more jobs than before the recession—even though the

creation of new jobs has not been fast enough to keep up with the number of college-educated people joining the labor force. Out of all the net jobs gained in the recovery, 2 million have gone to workers with a Bachelor’s degree or better and 1.6 million have gone to workers with an Associate’s degree or some postsecondary education. Workers with a high school diploma or less have lost 230,000 more jobs in the recovery.

Why have college-educated workers weathered the recession better than less-educated workers? Part of the reason is the long-term decline in low-skill jobs in the American economy resulting from advances in labor-saving technology. Technological changes, principally computing technology, supercharged by global competition, have been automating repetitive tasks and routines in all jobs, leaving non-repetitive tasks and higher levels of human interaction to people. The result is increasing demand for hard cognitive knowledge, skills, and abilities, as well as softer interpersonal skills and personality traits. In the American institutional context, this has meant a shift from jobs that require high school or less to jobs that require at least some college.

Manufacturing, for example, shed 5.5 million jobs from 1980 to 2007. Simultaneously, globalization and the shift of American jobs overseas have led to a decline in the need for low-skilled labor. The economy is creating new jobs, but typically they require more education. For example, over the same time period, the economy created 11.6 million jobs in healthcare and education—areas in which most jobs require a Bachelor’s degree or at least some college.<sup>4</sup>

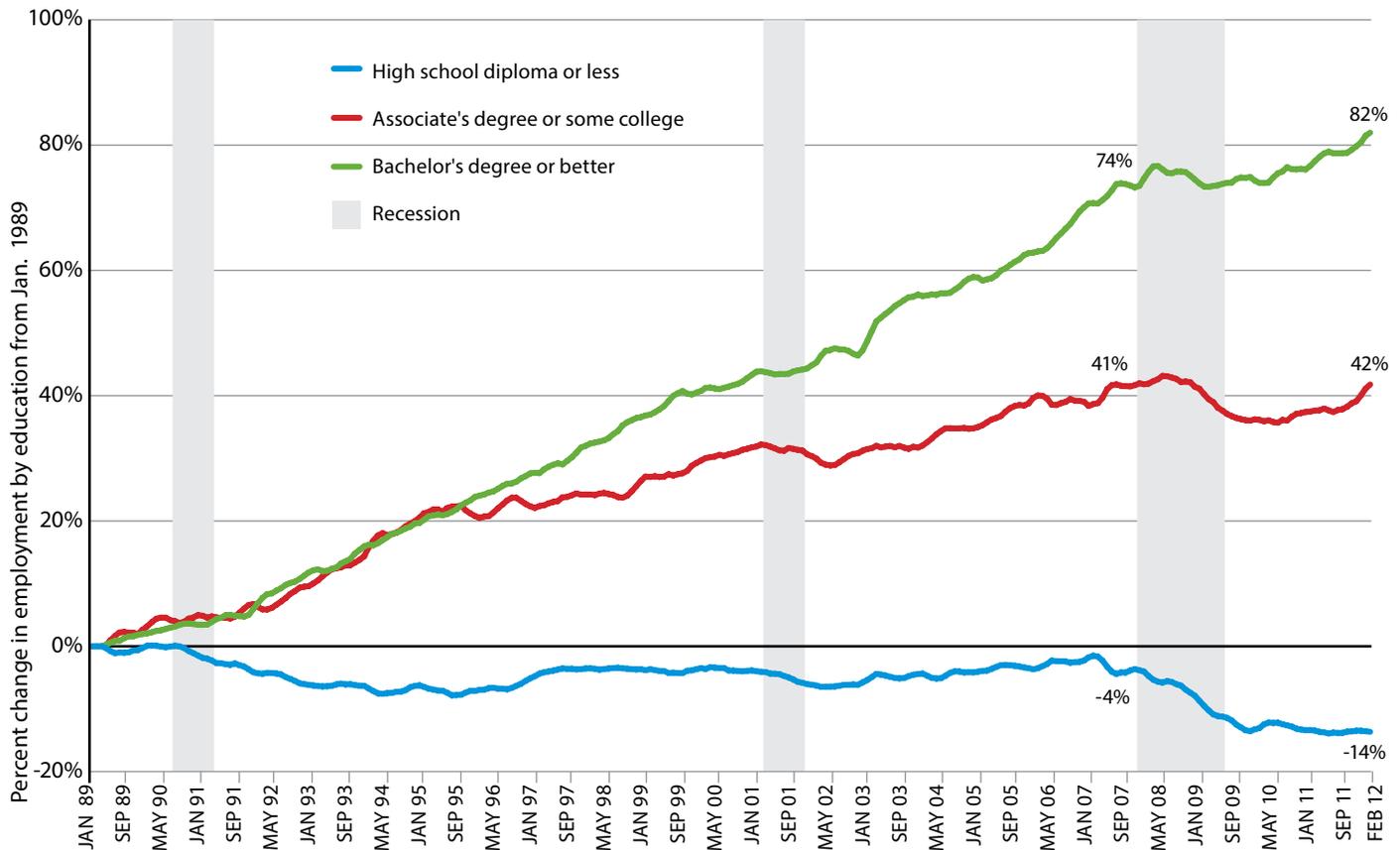
Underneath the disappointing jobs numbers, the shift toward more postsecondary education continued and, perhaps, accelerated in the Great Recession. At the beginning of the recession, the workforce had 4 percent fewer workers with a high school diploma as their highest educational



**Underneath the disappointing jobs numbers, the shift toward more postsecondary education continued and, perhaps, accelerated in the Great Recession.**

<sup>4</sup>Peck, Don. (September 2011). Can the Middle Class Be Saved? *The Atlantic* (<http://www.theatlantic.com/magazine/archive/2011/09/can-the-middle-class-be-saved/8600/>).

**FIGURE 4. The growth in employment in the past two decades has been entirely due to increases in college-educated workers while workers with a high school diploma or less have lost ground.**



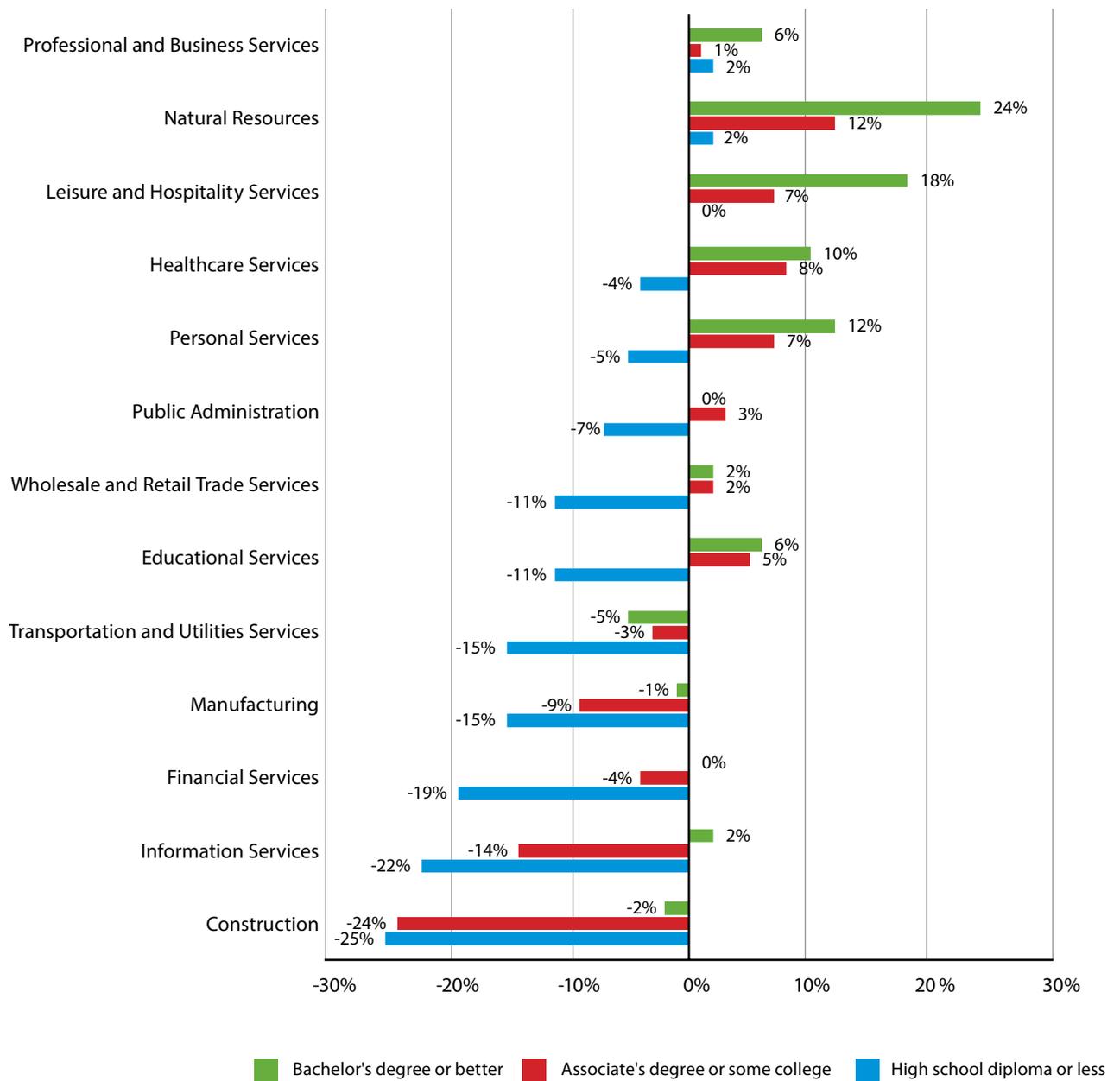
Source: Authors' estimate of the Current Population Survey data (1989–2012.) Employment includes all workers aged 18 and older.  
 Note: The monthly employment numbers are seasonally adjusted using the U.S. Census Bureau X-12 procedure and smoothed using four-month moving averages.

attainment than in 1989. In 2012, the workforce has 14 percent fewer workers with a high school diploma as their highest educational attainment than in 1989. That means the number of jobs available to those with just a high school diploma dropped by 10 percentage points in just five years. By comparison, the number of workers with some college or an Associate's degree increased by 40 percent from 1989 to 2012 and, over the same period, the number of workers with a Bachelor's degree or better nearly doubled. In other words, employment growth since 1989 has been driven entirely by workers with education beyond high school.

**Employment growth since 1989 has been driven entirely by workers with education beyond high school.**

Despite increases in the average education level of the workforce, those increases still haven't been enough to keep up with demand. Goldin and Katz (2008) and Carnevale and Rose (2011) detail rising wage premiums for college-educated workers over the past 30 years, suggesting that their supply continues to fall short of demand.

**FIGURE 5: The more educated have fared better in the recession and recovery, within every industry.**  
*(Percent Jobs Change by Education Level, December 2007–February 2012)*



Source: Authors' estimate of the Current Population Survey data (2007–2012.) Employment includes all workers aged 18 and older. The percentage change is as a share of total employment in December 2007. A negative sign indicates a negative change (job losses).

## **INDUSTRY CHANGES INCREASED THE DEMAND FOR COLLEGE.**

Industries that had lower proportions of jobs requiring postsecondary education, such as manufacturing and construction, were the industries hit hardest during the recession and accounted for nearly 5.2 million of the 7.2 million jobs lost; wholesale and retail trade accounted for an additional 1 million of the jobs lost. Industries with high concentrations of college-educated workers, such as public administration, education, and healthcare, held up relatively well during the recession, adding 1.5 million jobs as federal aid to state and local governments and fiscal stabilizers combatted some of the downturn's impact.

New jobs in all industries are demanding more education. Job gains during the recovery did not narrow the differences education made in the recession. In every industry except public administration, the demand for more-educated workers is greater than for less-educated workers. Deep cuts in federal, state, and local governments have hurt both the less educated as well as the more educated. A significant number of highly educated workers in public sector occupations such as education, community and social services, business and financial operations, computer and mathematical science, and architecture and engineering have lost jobs.

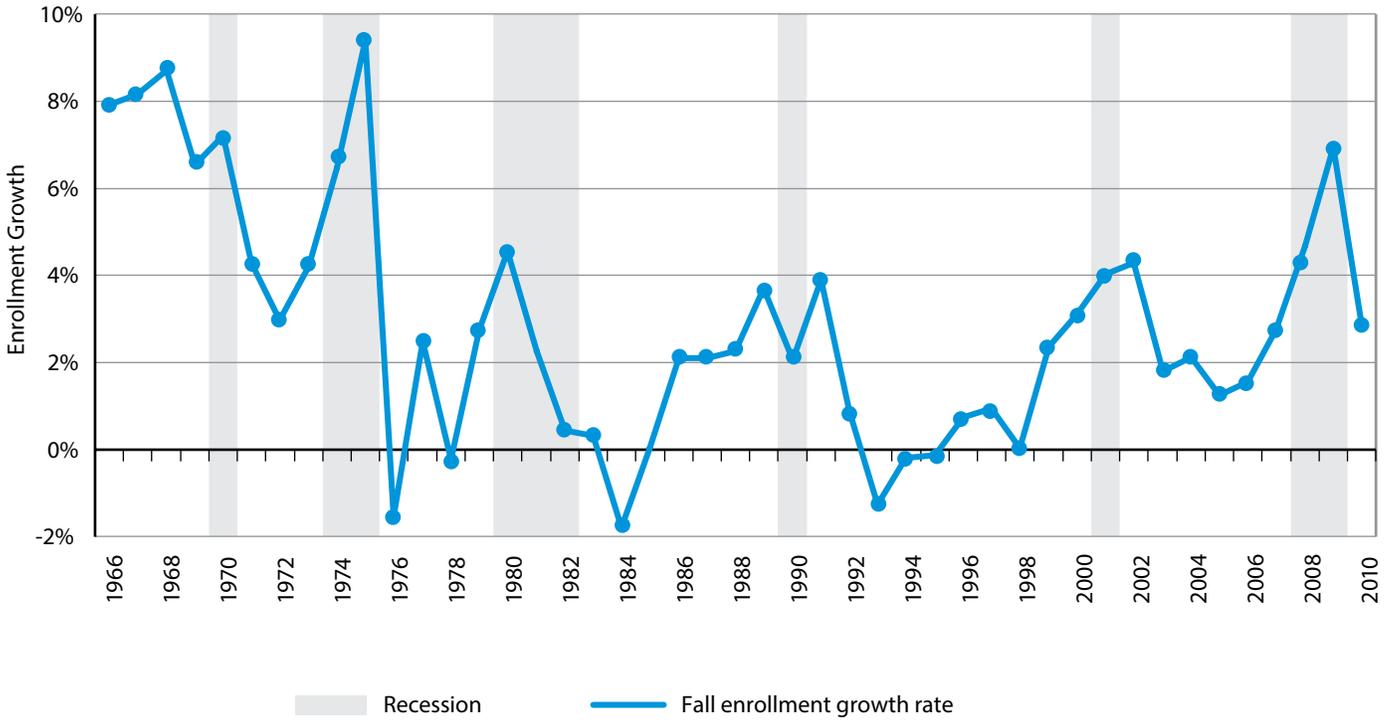
The affected industries are changing the composition of their workforces. In manufacturing—traditionally considered in the low-skill, blue-collar sector—employment has dropped by 15 percent for workers with a high school diploma or less since the recession began, but only 1 percent for workers with a Bachelor's degree or better. In construction, employment dropped by 25 percent for those with a high school diploma or less but only 2 percent for workers with a Bachelor's degree or better.



### **New jobs in all industries are demanding more education.**

Postsecondary enrollment rates jumped in the recession and have remained high. During a weak labor market, when jobs are scarce and wages are stagnant, workers often seek to improve their training and leverage that for better employment. Delaying entry into the labor market by enrolling in postsecondary education is also a way to seek shelter and build human capital until the labor market improves. Figure 6 shows that postsecondary enrollment grew by 7 percent in 2009 after only 1 percent growth in 2005. But it has plummeted since then to 3 percent in 2010.

**FIGURE 6. Postsecondary enrollment skyrocketed in the recession, as potential labor market entrants sought shelter from a harsh job market.**



Source: Total fall enrollment in all postsecondary degree-granting institutions is obtained from Digest of Education Statistics 2011, published by the National Center for Education Statistics using Integrated Postsecondary Education Data System (IPEDS) data made available through the U.S. Department of Education ([http://nces.ed.gov/programs/digest/d11/tables/dt11\\_198.asp?referrer=report](http://nces.ed.gov/programs/digest/d11/tables/dt11_198.asp?referrer=report)).

## CONCLUSION

The Great Recession that began in December 2007 laid bare many of the shortcomings of the American workforce, especially the lack of workers with postsecondary education. A large majority of jobs lost in the recession and in the recovery had been held by workers with a high school diploma or less. The only real gains made during the still struggling recovery have been in jobs filled by workers with at least some postsecondary education. The gradual shift to more-educated workers has been going on for decades, but the recession gave it a mighty push. It also left the country with an urgent need to find a way to train workers for the more skilled jobs.

NOTES



NOTES







*The College Advantage* comprises a full report and an executive summary.  
Both can be accessed at [cew.georgetown.edu/collegeadvantage](http://cew.georgetown.edu/collegeadvantage).

GEORGETOWN UNIVERSITY



---

Georgetown Public  
Policy Institute

---

Center on Education and the Workforce

3300 Whitehaven Street, NW | Suite 5000 | Washington, DC 20057 | [cew.georgetown.edu](http://cew.georgetown.edu)

union bug



# West Virginia Higher Education Policy Commission

---

**Report to the Legislative Oversight Commission  
on Education Accountability**

**September 10, 2012**

**VISION 2015:  
The West Virginia Science and Technology Strategic Plan**





West Virginia Higher Education Policy Commission  
1018 Kanawha Boulevard East, Suite 700  
Charleston, WV 25301  
(304) 558-0699  
www.hepc.wvnet.edu

MEMORANDUM

TO: Legislative Oversight Commission on Education Accountability

FROM: Paul L. Hill 

DATE: September 10, 2012

RE: West Virginia Science and Technology Strategic Plan

---

In accordance with West Virginia Code §18B-18B-2(e), an update on the plan, “Vision 2015: The West Virginia Science and Technology Strategic Plan”, is hereby submitted to the Legislative Oversight Commission on Education Accountability on behalf of the West Virginia Science and Research Council.

The original strategic state plan, created in 2005, has been enhanced and updated while continuing to deliver impressive results. The plan was reviewed and revised by a diverse group of stakeholders during 2011 and earlier this year when it was approved by a unanimous vote of the West Virginia Science and Research Council. The revised plan includes projections and strategic goals to move science and technology development forward in West Virginia creating new patents, licensing of intellectual property, founding of new businesses and job creation.

By pursuing a strategy that includes these objectives while training students to be active participants in the Science, Technology, Engineering and Mathematics (STEM) workforce, the goal of creating job opportunities and keeping the best and brightest students in West Virginia is paying dividends. University partners, especially West Virginia University and Marshall University, have exceeded the original goal of “doubling external research funding every 5 years” – in 2010 (the latest year for which federal data are available), state academic research and development expenditures were \$195 million, more than triple the \$60 million in 2005. Five new high-tech companies have been established from research and development at West Virginia colleges and universities. Additionally, impressive gains have occurred in the number of students majoring in STEM fields with goals exceeded for both minority and other underrepresented groups and for students overall. In 2010, more than 2,400 students received bachelor’s degrees in a STEM field, a 13 percent increase in five years.

All of the stakeholders in *Vision 2015* are focused on reaching the vision that “Research and innovation will be the number one driver of West Virginia’s new, diverse, and prosperous economy.” The revised *Vision 2015* strategic plan will continue to guide the efforts in this important objective for West Virginia and our shared future.





# VISION2015

THE WEST VIRGINIA SCIENCE AND TECHNOLOGY STRATEGIC PLAN

# VISION 2015

THE WEST VIRGINIA SCIENCE AND TECHNOLOGY STRATEGIC PLAN

## FOREWORD

VISION 2015 is a strategic framework of actions and initiatives that position West Virginia to achieve measurable growth in technology-based economic development. The *Vision: By 2015, research and innovation will be the number one driver of West Virginia's new, diverse and prosperous economy*, is the essential driver of this plan. To achieve this goal and to develop cutting-edge research that will spawn new business growth, the state will invest \$250 million in both human and physical infrastructure. West Virginia embraces this plan as the state continues to diversify and transform its traditional extractive industrial base to a more high-tech, knowledge-based economy. Doing so may create 33,000 jobs and an economic impact greater than \$3.3 billion over the next decade.

West Virginia will grow the research enterprise by hiring nationally prominent and otherwise promising faculty, increasing the production of scientists and engineers, and building research facilities and parks. The Southern Growth Policies Board has recognized this effective strategy in *Innovation U. – New University Roles in a Knowledge Economy*. In its *Rising Above the Gathering Storm* and *Rising Above the Storm, Revisited* the National Academy of Sciences, as well as the American Academy for the Advancement of Science, the National Association of Manufacturers and members of the U.S. Congress have presented alarming data on declining numbers of domestic engineering and science college graduates at a time when the nation is experiencing technological expansion and greater demand for such skills.

West Virginia is not alone in engaging this strategy, but joins the national effort, recognizing that surrounding states (Ohio, Virginia, Kentucky and Pennsylvania) have initiated similar strategic plans—and aggressive state funding—for capitalizing on research growth. West Virginia's universities can no longer be viewed as merely post secondary academic institutions, but rather as the nucleus of economic strength, entrepreneurship and innovation.

While building the state's economy, the results of VISION 2015 will create critical mass in the state scientific community, enhance diversity of the research faculty and suppress the allure of well-financed research initiatives outside the state's borders.

Key components of VISION 2015 are captured on the next page. This approach allows a holistic view of the specific but interrelated actions to be undertaken. Details of each activity are subsequently presented in one page "Goal-Plans" that outline specific steps and measures to be taken. Fourteen goals in five categories will be coordinated by the West Virginia Higher Education Policy Commission, the Science and Research Council and the West Virginia Development Office, in conjunction with the business community and higher education institutions.

West Virginia University (WVU) and Marshall University (MU) are major participants in VISION 2015 and have shared extensively in its development. Milestones in the achievement of these goals will be reported on an annual basis.

This version of VISION 2015 was revised in 2012 to reflect achievements and challenges to date.



# West Virginia Science and Technology STRATEGIC PLAN

By 2015, research and innovation will be the number one driver of West Virginia's new, diverse and prosperous economy.



## HUMAN AND PHYSICAL INFRASTRUCTURE

- #1 ■ Increase the number of critical science, technology, engineering and mathematics (STEM) researchers at WVU and MU by 15% by 2015
- #2 ■ Increase the space allocated to externally funded STEM researchers to achieve levels comparable to similar institutions on a per researcher basis by 2015
- #3 ■ Continue to invest in and nurture four nationally competitive research clusters (Advanced Energy, Chemicals and Advanced Materials, Biometrics, and Biotechnology) and identify other emerging clusters for support
- #4 ■ Establish statewide or regional infrastructure to provide 21st-century library resources to all institutions
- #5 ■ Implement a Cyberinfrastructure Strategic Plan, recognizing its strategic importance to Science and Technology

## RESEARCH AND INNOVATION

- #6 ■ Develop innovation ecosystems to enable the start-up of new technology-based businesses
- #7 ■ Increase competitive external funding to reach at least \$240 million by 2015 and grow annual public and private R&D expenditures

## POLICY

- #8 ■ WVU and MU to create an environment to encourage innovation, commercialization, economic development and entrepreneurship among faculty and students
- #9 ■ Double state-based, long-term, dedicated funding for research and innovation throughout West Virginia

## EDUCATION AND OUTREACH

- #10 ■ Strengthen current regional alliances and create new active regional or global alliances among research universities, the private sector and government agencies by 2015
- #11 ■ Increase the graduation of STEM students by 3% per year with an emphasis on broadening participation. Maintain minority participation at least in ratio to growth
- #12 ■ Increase the number of Ph.D.'s awarded in science and engineering fields by 20% in five years, with additional focus on U.S. nationals and diversity

## ECONOMIC DEVELOPMENT

- #13 ■ Create a statewide P-20 STEM education and workforce development plan

- #14 ■ Create early-stage funding mechanisms to assist in the commercialization of technologies for entrepreneurs, start-ups and small technology firms



# GOAL ONE

INCREASE THE NUMBER OF CRITICAL  
STEM RESEARCHERS AT MU AND WVU  
BY 15% BY 2015.

## ACCOUNTABILITY

Deans with science and engineering programs

## RATIONALE OR BRIEF BACKGROUND

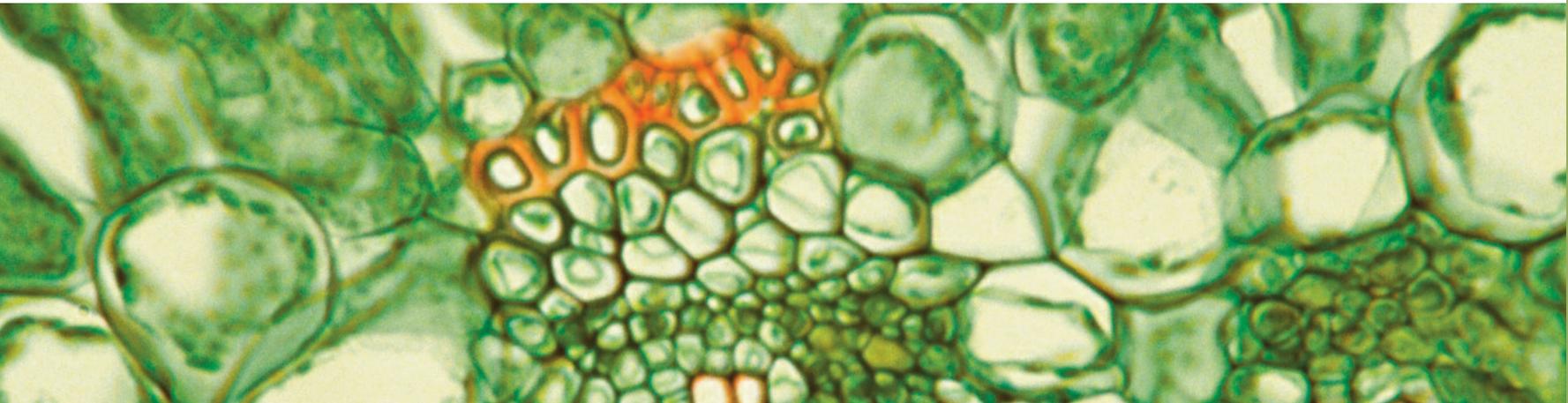
Today's economy is fundamentally different from the previous decade. It is more global, more knowledge-driven, more entrepreneurial and more dynamic. Increasing the number of STEM researchers provides additional in-state research and development and boosts the production of STEM graduates to build the advanced workforce.

## MEASUREMENT

- Number of doctoral STEM researchers at WVU.
  - BASIS: 468 STEM instructional faculty and doctoral researchers in 2010
  - GOAL: 538 STEM instructional faculty and doctoral researchers in 2015
- Number of doctoral STEM researchers at MU.
  - BASIS: 155 STEM instructional faculty and doctoral researchers in 2010
  - GOAL: 175 STEM instructional faculty and doctoral researchers in 2015

## IMPLEMENTATION PLANS

- Add 50 new STEM tenure-track faculty positions in areas of STEM success at WVU by 2015. Add 20 new STEM research active faculty and replace retiring STEM faculty with 10 more research active faculty at MU by 2015.
- Encourage the hiring of externally funded research faculty and postdoctoral scholars in concert with growth in research funding.
- Explore models for research faculty who are funded jointly by institutional and external sources.



goal one

## GOAL TWO

INCREASE THE SPACE ALLOCATED TO EXTERNALLY FUNDED STEM RESEARCHERS TO ACHIEVE LEVELS COMPARABLE TO SIMILAR INSTITUTIONS ON A PER RESEARCHER BASIS BY 2015.

### ACCOUNTABILITY

Associate VP Research in conjunction with Deans and University Planning

### RATIONALE OR BRIEF BACKGROUND

In order to be competitive for external funding, researchers must have adequate space in which to conduct their work – comparable to that of the peers against whom they are competing. To maximize the use of expensive research space, tenure-track researchers must be apportioned adequate space and tenured researchers apportioned space commensurate with their F&A-bearing external funding.

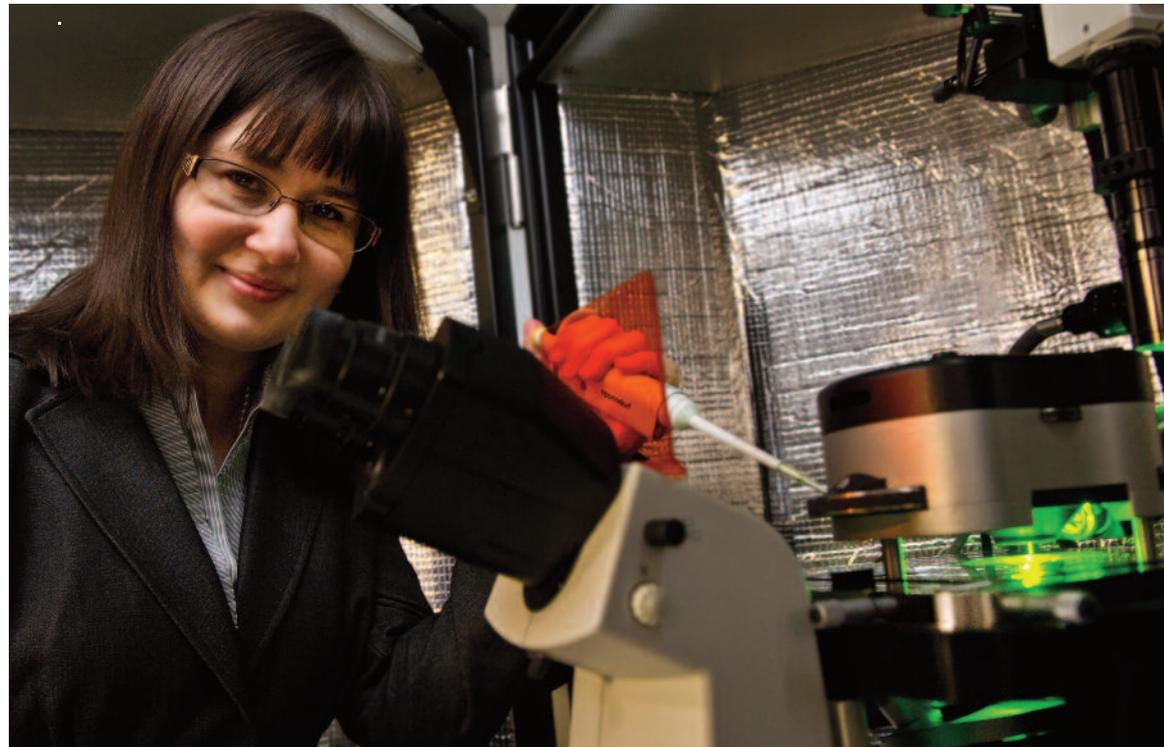
### MEASUREMENT

- Average Square Feet allocated per funded researcher or
- Average Square Feet allocated per dollar of external funding

### IMPLEMENTATION PLANS

- Define for WVU and set of peers the Average Square Feet allocation per funded researcher or Average Square Feet allocated per external dollars as of January 2012.
- Work with Deans on reallocation of space from unfunded to funded researchers until peer average is met.
- Marshall will continue to follow its space evaluation and allocation procedure to give priority to meeting the research space needs of externally funded programs.
- Marshall will continue with its plans to add translational research space and research space for engineering and biomedical research.

goal two



# GOAL THREE

CONTINUE TO INVEST IN AND NURTURE FOUR NATIONALLY COMPETITIVE RESEARCH CLUSTERS (ADVANCED ENERGY, CHEMICALS AND ADVANCED MATERIALS, BIOMETRICS, AND BIOTECHNOLOGY) AND IDENTIFY OTHER EMERGING CLUSTERS FOR SUPPORT.

## ACCOUNTABILITY

Vice Chancellor for Science and Research

## RATIONALE OR BRIEF BACKGROUND

To reach our vision, West Virginia must increase investment in university-based research in science, technology, engineering and mathematics (STEM) fields. STEM research offers the best opportunities for both new business creation and competitive expansion of existing industries in the state. Many studies have demonstrated the direct link between economic development and university-based research.

Given the interdisciplinary nature of today's science, national competitiveness resides in the formation of multidisciplinary teams. To be successful in driving West Virginia's new economy, we must recruit and support competitive teams of investigators in research thrusts or clusters, where broad-based communities of basic and applied researchers and entrepreneurs work together on the same technology or project.

## WVU HAS THE FOLLOWING NATIONALLY COMPETITIVE CENTERS:

- National Research Center for Coal and Energy funded by state and federal sources.
- Sensory Neuroscience Research Center funded by the Howard Hughes Medical Institute and the NIH.
- Center for Identification Technology (CITeR) funded by NSF and industry members.
- Virtual Medical Campus (VMC) funded by the Departments of Justice and Health and Human Services.

In addition, WVU has a number of emerging research centers supported by the WVU Research Corporation and external funding in the areas of advanced power and electricity, the environment, nanobiosciences, and systems biology.

## MARSHALL HAS THE FOLLOWING EXTERNALLY FUNDED CENTERS:

- MU's Joan C. Edwards Cancer Center supported by NIH.
- The recently opened Charles H. McKown Translational Genomics Institute.
- The Center for Diagnostic Nanosystems supported by the U.S. Department of Energy.
- The Center for Environmental, Geotechnical and Applied Sciences funded by state and federal sources.
- The Forensic Science Center funded by the Department of Justice.

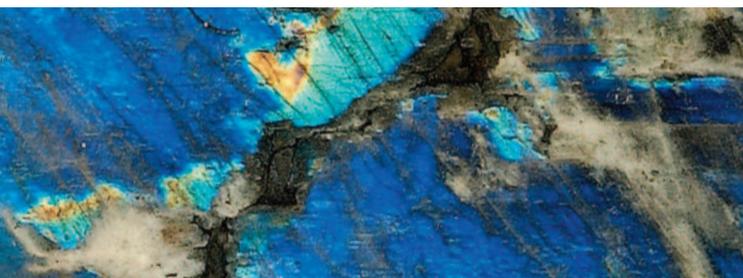
## MEASUREMENT

- Existing research clusters receive at least one federal/foundation grant or contract annually to support research work.
- At least two new clusters identified and funded by 2013.

## IMPLEMENTATION PLANS

- Directors of existing research centers develop/revise evaluation plan to ensure that each center meets funding milestones and goals for economic development.
- Identify two or more emerging clusters by identifying research areas within the state's research universities that have the greatest potential for allowing researchers to obtain competitive funding and enhance economic development by October 2012.
- Identify and obtain funding, space, personnel and other requirements for emerging clusters by August 2013.
- Develop and implement an evaluation plan to ensure that each newly established center meets milestones and goals for competitiveness and economic development within 12 months of its funding.

goal three



## GOAL FOUR

ESTABLISH STATEWIDE OR REGIONAL INFRASTRUCTURE TO PROVIDE 21ST-CENTURY LIBRARY RESOURCES TO ALL INSTITUTIONS.

### ACCOUNTABILITY

Higher Education Policy Commission - Digital Library Consortium Steering Committee

### RATIONALE OR BRIEF BACKGROUND

The annual costs for academic library serials and database subscription resources continue to rise at an alarming rate, often double or triple that of the annual consumer price index. In addition to these essential research materials that support resident and distance students, advances in mobile technologies have necessitated attention to providing electronic books and journals in portable formats and/or packaging library services to meet a “just-in-time” scholarly community. To meet increasing library demands when the state’s academic libraries are making cuts to retain existing collections because of stagnant budgets, materials purchasing has declined sharply, leaving little room for innovation or expansion of services and resources.

A consolidated approach to purchasing is required to take advantage of potential savings to allow academic libraries to meet student and faculty demands. While academic libraries do serve a population in which specific curriculum and research needs are supported, it is essential that any consortium collaborate with existing statewide library network efforts such as those maintained by the West Virginia Library Commission, State Department of Education, and private academic colleges and universities to provide the most robust and diverse collection of academic library resources possible.



### MEASUREMENT

- One-time funding of \$1 million awarded to the HEPC to establish a statewide academic digital library network with the initial purchase of STEM and multi-disciplinary digital content.
- Annual funding >\$1 million that anticipates rising inflation awarded to the HEPC to access, maintain, and increase digital library collections and services accessible to all higher education students and faculty in the state.
- Place emphasis on resources that support the STEM disciplines and general education serving the most institutions across-the-board.
- Place emphasis on linking existing networks such as the WV Info Depot and upcoming statewide Connecting2 Collections project spearheaded by Lyrasis.
- Gradually add programs that address higher education student/faculty demands such as 24/7 *Ask a Librarian* chat services and statewide 24-hour rapid digital resource sharing to supplement existing interlibrary loan.

### IMPLEMENTATION PLANS

- Establish a steering committee during spring 2012 that reports to the HEPC and consists of public and private academic library directors from strategically selected institutions representing a variety of sizes and types of institutions.
- Include representation on the steering committee from the Community and Technical College system, the Library Commission and U.S. Department of Education to ensure full collaboration and limit duplication.
- During FY 2012-13, obtain one-time funding to aid in purchasing full-text digital content that will establish the statewide academic digital library.
- After establishment, obtain annual ongoing support for initial purchases, inflation, and expansion of the materials and services provided by the consortium.
- Evaluate the digital library collections and services annually through usage statistics and user feedback; stay abreast of program changes in higher education to help anticipate statewide user support needs.
- Enhance materials and programs as library technology and information services evolve and improve.

# GOAL FIVE

IMPLEMENT CYBERINFRASTRUCTURE STRATEGIC PLAN, RECOGNIZING ITS STRATEGIC IMPORTANCE TO SCIENCE AND TECHNOLOGY.

## ACCOUNTABILITY

HEPC Vice Chancellor for Science and Research

## RATIONALE OR BRIEF BACKGROUND

Research and technology as well as commerce are driven more and more by high-speed internet access and computer-thinking. In today's Information Age, this means the availability of and access to stores of digital data and the ability to rapidly move it from anywhere to anywhere in the world, specialized instrumentation and evermore powerful computational resources to process data into meaningful scientific understanding.

Cyberinfrastructure at its most conceptual level is the fabric of connectivity that enables levels of communication, collaboration and access necessary for 21st-century research. West Virginia must improve its cyberinfrastructure, just as any other component of the state's infrastructure, by not only improving access to the internet for both business and research, but also improving computational resources for data analysis and scientific computing at major research facilities.

When fully realized the West Virginia cyberinfrastructure will enable and support the full participation of our state's scientists and researchers in the international pursuit of new scientific discoveries and knowledge. Additionally, learning and workforce development will rely more on cyberinfrastructure

as distance-learning, online educational resources, knowledge repositories and other research learning and collaboration opportunities increase.

## MEASUREMENT

West Virginia will increase cyberinfrastructure by:

- Supporting and upgrading two small-medium facility high-performance computing centers at WVU and MU, which will enhance research and data analysis at the state's two top research institutions, and
- Establishing conference room facilities in each major building on the WVU and MU campuses. This will enable both distance-learning and virtual organization capabilities as researchers collaborate with their peers from across the world.
- Subscription to Internet2 through the SEGP at Marshall University by at least three primarily undergraduate institutions.

## IMPLEMENTATION PLANS

- By 2014, three PUIs subscribed to Internet2 and using it for research.
- By 2015, Charleston, will have connectivity to Internet2 at minimum participation levels.
- By 2013, double the number of web-conferencing rooms at WVU and MU, and increase these facilities by 25% per year until each building on the two main campuses is equipped with a web-conference-capable room.
- By 2015, high-performance computing facilities at WVU, MU and West Virginia State University utilized at 75% of capacity and supported by institutions and user fees for maintenance and growth.



# GOAL SIX

DEVELOP INNOVATION ECOSYSTEMS

TO ENABLE THE START-UP OF NEW

TECHNOLOGY-BASED BUSINESSES.

## ACCOUNTABILITY

State of West Virginia and Director of the Office of Technology Transfer



## RATIONALE OR BRIEF BACKGROUND

To achieve the goal of growing the state's economy through research and innovation, new businesses must be created from the state's investment in university research. Biotechnology, nanotechnology, energy and the environment and advanced materials represent the leading multidisciplinary research efforts being advanced at WVU and Marshall.

## MEASUREMENT

- Number of start-up companies based on university-developed technology.
- Number of employees working in those companies.
- Amount of financial investment in the companies.

## IMPLEMENTATION PLANS

A key to success will be efforts on behalf of the State to build a climate conducive to growth in venture capital investments – all other plans hinge on such a climate.

- Engage a technology marketing group to assist in the assessment of WVU and MU-developed technologies.
- Grow technology business incubator capacity focused on such companies.
- Have a plan for housing such in the WVU Research Park, Kinetic Park or the West Virginia Regional Technology Park.
- Expand the capacity of the network of Angel and Venture financing available in West Virginia.
- Expand the network of technical assistance and business support available to university spinouts.
- Develop technology harvesting capability through a program modeled on those in Kentucky.
- Develop entrepreneurial sabbatical policies at MU and WVU.
- Continue to collaborate with TechConnectWV to develop entrepreneurial support programs in the major multidisciplinary clusters.

# GOAL SEVEN

INCREASE COMPETITIVE EXTERNAL FUNDING TO REACH AT LEAST \$240 MILLION BY 2015 AND GROW ANNUAL PUBLIC AND PRIVATE R&D EXPENDITURES.

## ACCOUNTABILITY

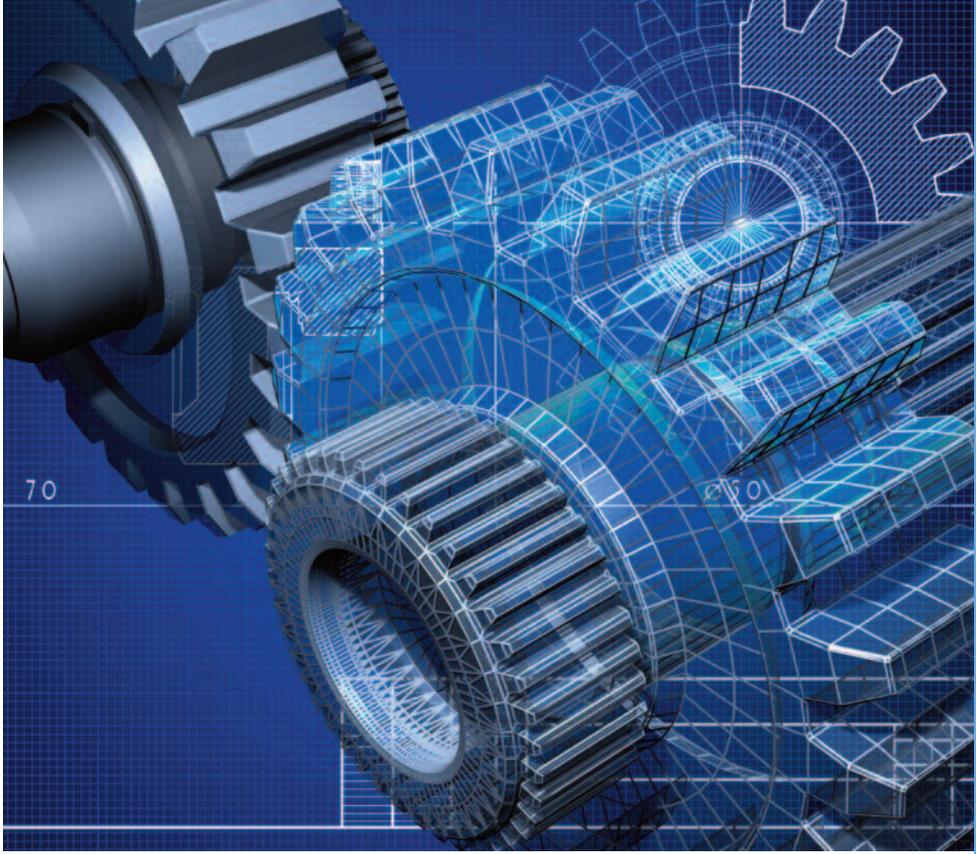
Vice Presidents for Research at WVU and MU

## RATIONALE OR BRIEF BACKGROUND

This goal was created in 2005, well before the current economic and federal funding climate. If current economic and political conditions make this goal unachievable, the alternative goal is to increase our standing in the NSF-reported rankings of funding and expenditures, with WVU achieving a ranking in the top 100.

## MEASUREMENT

- Ranking in NSF reports of R&D expenditures.
- 2012 WVU ranks 116
- 2020 goal is to rank 100



## IMPLEMENTATION PLANS

- Increase industrial R&D support received by institution.
- Continue grants writing workshops for faculty.
- Increase intensive mentoring of new faculty in grants writing.
- Place specialists in colleges to assist faculty with growing the competitiveness of their proposals.
- Match faculty expertise to higher probability funding programs to increase efficiency of grants writing.
- Grow teams capable of seeking and securing large dollar multi Principal Investigator grant programs.

goal seven

## GOAL EIGHT

EACH INSTITUTION (WVU AND MU) WILL CREATE AN ENVIRONMENT TO ENCOURAGE INNOVATION, COMMERCIALIZATION, ECONOMIC DEVELOPMENT AND ENTREPRENEURISM AMONG FACULTY AND STUDENTS.

### ACCOUNTABILITY

State of West Virginia and University Deans

### RATIONALE OR BRIEF BACKGROUND

When coupled with the appropriate ecosystem, such environments will stimulate growth in technology-based employment for West Virginians.

### MEASUREMENT

- Number of start-up companies based on university technology.
- Number of employees working in those companies.

### IMPLEMENTATION PLANS

A key to success will be efforts on behalf of the State to build a climate conducive to growth in venture capital investments – all other plans hinge on such a climate.

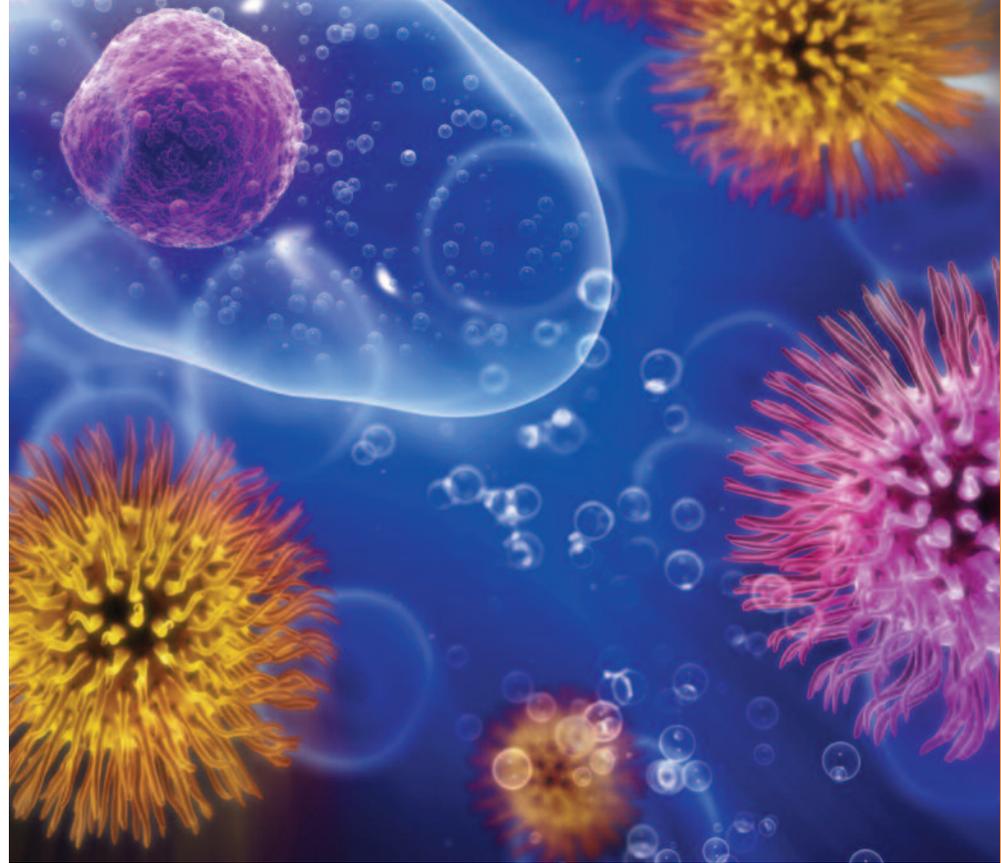
- Modify promotion and tenure policies to encourage and reward technology transfer and entrepreneurial activities.
- Bring private partners to campus to explore with faculty how their innovations can be commercialized.
- Develop an entrepreneurship track for STEM graduate students interested in commercialization of innovative discoveries.
- Introduce start-up companies to incubator space at the West Virginia Regional Technology Park in South Charleston.
- Develop policies facilitating entrepreneurial sabbaticals.

goal eight



## GOAL NINE

DOUBLE STATE-BASED, LONG-TERM, DEDICATED FUNDING FOR RESEARCH AND INNOVATION THROUGHOUT WEST VIRGINIA.



## goal nine

### ACCOUNTABILITY

HEPC Chancellor

### RATIONALE OR BRIEF BACKGROUND

The West Virginia Legislature created the Research Challenge Fund in 2004 to dedicate 0.5% of racetrack video lottery proceeds toward research funding. Although it produced about \$4 million annually for the West Virginia research community in its early days, it now generates only about \$3.2 million. Increasing the proportion incrementally from 0.5% to 1% by 2015 or \$6.4 million annually would provide significant new and recurring Research Challenge Funds. In addition, funds derived from shale gas development fees or coal severance taxes could also be devoted to science and research by funding the RCF. RCF can be used to advance research and innovation to full commercialization and to develop the highly skilled workforce required for the high technology businesses relocating to West Virginia and for other businesses being established in the state from new university start-ups.

### MEASUREMENT

- 2005 BASELINE: 0.5% of video lottery proceeds to RCF
- 2015 GOAL: 1.0% of video lottery proceeds to RCF
- 2015 GOAL: \$1 million of energy production fees to RCF annually

### IMPLEMENTATION PLANS

- Obtain sponsorship of a bill to increase the lottery proceeds dedicated to RCF by January 31, 2013.
- Obtain sponsorship of a bill to direct \$1 million of shale gas and/or coal severance fees annually to RCF by January 31, 2013.

## GOAL TEN

STRENGTHEN CURRENT REGIONAL ALLIANCES AND CREATE NEW ACTIVE REGIONAL OR GLOBAL ALLIANCES AMONG RESEARCH UNIVERSITIES, THE PRIVATE SECTOR AND GOVERNMENT AGENCIES BY 2015.

### ACCOUNTABILITY

University Presidents

### RATIONALE OR BRIEF BACKGROUND

The future funding climate will necessitate partnerships with other academic institutions, private entities, and federal agencies in order to retain a robust R&D effort at West Virginia's research universities.

### MEASUREMENT

- Number of such teaming arrangements and number of active grant awards received by such teams.

### IMPLEMENTATION PLANS

- WVU is currently engaged in one such partnership with the Regional University Alliance. This alliance seeks to be self-sustaining via external funding by 2015.
- WVU has an ongoing collaboration with National Radio Astronomy Observatory and international universities funded by an NSF Partnerships for International Research and Education award. One additional such award will be sought in the area of energy.
- WVU and Marshall will sustain their RII-funded collaboration and build a new collaboration for future RII opportunities, to include industrial partners.



## GOAL ELEVEN

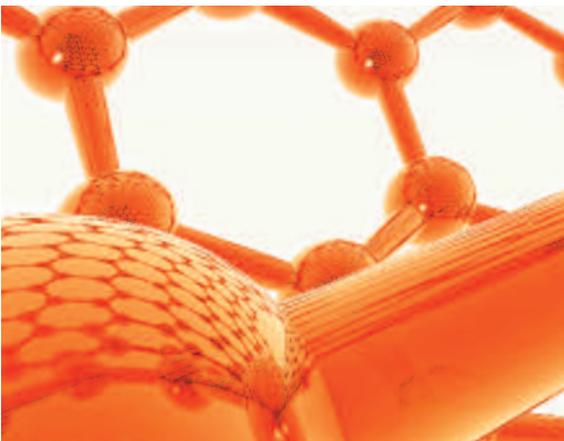
INCREASE THE GRADUATION OF STEM STUDENTS BY 3% PER YEAR, WITH AN EMPHASIS ON BROADENING PARTICIPATION. MAINTAIN MINORITY PARTICIPATION AT LEAST IN RATIO TO GROWTH.

### ACCOUNTABILITY

Provosts at WVU and MU

### RATIONALE OR BRIEF BACKGROUND

The vision “*research and innovation will be the number one driver of West Virginia’s economy*” requires an increase in the number of scientists and engineers completing degrees and working in the state. Increasing the number of STEM graduates is an essential component of workforce development for supporting new, technology-focused businesses.



### MEASUREMENT

Number of STEM degrees awarded in each year

- BASIS: 1,472 STEM bachelor’s degrees awarded by WVU in 2010
- GOAL: 1,706 STEM bachelor’s degrees awarded in 2015

---

- BASIS: 142 STEM bachelor’s degrees awarded to minority students in 2010
- GOAL: 164 STEM bachelor’s degrees awarded to minority students in 2015

---

- BASIS: 292 STEM bachelor’s degrees awarded by Marshall in 2010
- GOAL: 338 STEM bachelor’s degrees awarded in 2015

---

- BASIS: 18 STEM bachelor’s degrees awarded by HEPC institutions to minority students in 2010
- GOAL: 21 STEM bachelor’s degrees awarded by HEPC institutions to minority students in 2015

### IMPLEMENTATION PLANS

- Increase recruiting efforts and scholarship offers to attract students, including minority students, to STEM programs.
- Develop and implement strategies to raise first-year retention rates.
- Identify at-risk freshmen and sophomores in STEM fields and provide supporting infrastructure for success.
- Promote awareness of STEM career opportunities to K-12 students.
- Improve K-12 STEM preparation through an institutional initiative involving both education and content specialists.

## GOAL TWELVE

INCREASE THE NUMBER OF Ph.D.'s AWARDED IN S&E FIELDS BY 20% IN FIVE YEARS, WITH ADDITIONAL FOCUS ON U.S. NATIONALS AND DIVERSITY.

### ACCOUNTABILITY

University Deans with science and engineering programs

### RATIONALE OR BRIEF BACKGROUND

To achieve our vision, we must increase the number of Ph.D.'s awarded in the state in S&E fields (1) to match growth in S&E research funding and programs and (2) to provide human resources in support of state economic development.

### MEASUREMENT

Number of Ph.D.'s awarded in S&E fields each year

- BASIS: 70 STEM Ph.D.'s awarded in 2010
- GOAL: 84 STEM Ph.D.'s awarded in 2015

### IMPLEMENTATION PLANS

- Add new faculty lines to mentor additional Ph.D. students and additional lab space to accommodate them.
- Award additional graduate research assistantships in line with anticipated externally funded research growth.
- Develop graduate scholarships to enhance the recruitment of high-profile doctoral candidates.
- Create additional incentives for increase in timely completion of doctoral degrees.
- Pursue recruiting opportunities for domestic minority students.



# GOAL THIRTEEN

CREATE A STATEWIDE P-20 STEM  
EDUCATION AND WORKFORCE  
DEVELOPMENT PLAN.

## ACCOUNTABILITY

Chancellors of the Community and Technical College System and the Higher Education Policy Commission

## RATIONALE OR BRIEF BACKGROUND

In order to meet the needs of the 21st century, West Virginia and the nation need a scientifically literate and trained workforce. Students from pre-school through college must have education and training to meet the employment needs of the future.

## MEASUREMENT

- P-20 STEM education and workforce plan developed by June 2013.

## IMPLEMENTATION PLANS

- Committee of education and economic development specialists formed to develop plan in July 2012.
- Plan drafted by January 2013 and public comment solicited.
- Plan revised and approved by the Science and Research Council and the Higher Education Policy Commission by June 2013.

# GOAL FOURTEEN

CREATE EARLY-STAGE FUNDING MECHANISMS TO ASSIST IN THE COMMERCIALIZATION OF TECHNOLOGIES FOR ENTREPRENEURS, START-UPS, AND SMALL TECHNOLOGY FIRMS.

## ACCOUNTABILITY

TechConnect West Virginia

## RATIONALE OR BRIEF BACKGROUND

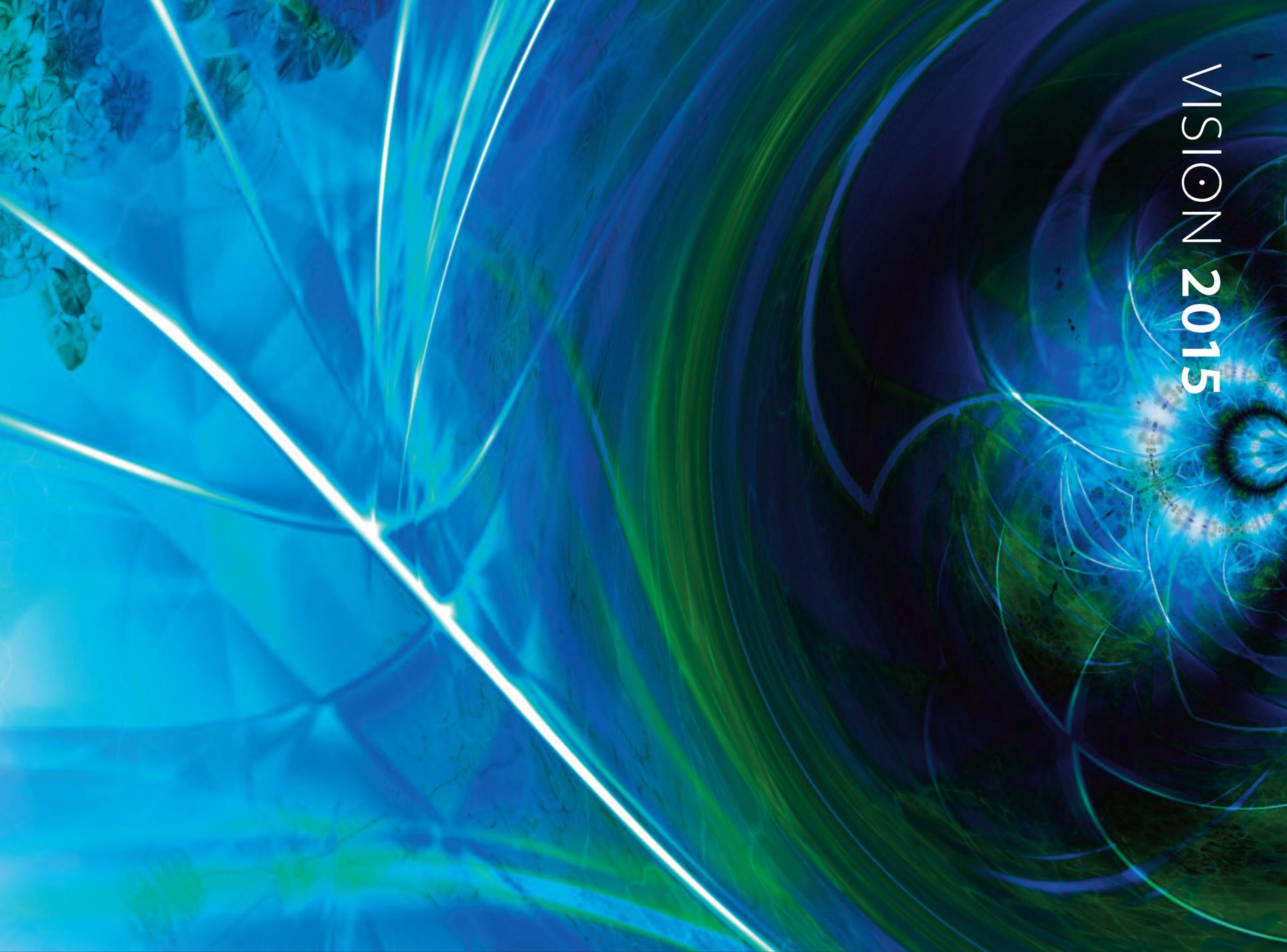
To achieve our vision for a diversified and innovation-based economy, we must dramatically increase the amount of technology transfer and commercialization occurring on higher education campuses. New firms, licensing agreements and industry collaborations must be created around products and technology developed in labs at our higher education institutions.

## MEASUREMENT

- Increase in amount of early-stage funding available.
- Number of newly formed start-up firms, licensing agreements and research collaborations which lead to newly commercialized products and technologies, job creation and capital investment.
- BASIS: Calculate amount of early-stage funding available in 2010 (total of INNOVA funding and WVJIT funding for that year). Average number of university spinout firms created annually between 2005 and 2010; average number of licenses issued annually between 2005 and 2010.
- GOAL: To increase early-stage funding of 2010 by 25% between 2012 and 2017. To increase number of spinout firms and licenses by 25% between 2012 and 2017.

## IMPLEMENTATION PLANS

- Coordinate with higher education institutions to identify and inventory research and other programs and activities that have commercial potential.
- Collaborate with members of TechConnect West Virginia (INNOVA, MATRIC, CAZ, CAA) to provide infrastructure to support those discoveries and technologies.
- Work with West Virginia Angel Investor Network to take the lead on identifying in-state capital development, as well as possibilities for accessing capital through other programs including the Jobs Investment Trust, the Capital Access Program, the Natural Capital Investment Fund, and other programs.
- Support reinstatement of the High Growth Business Investment Tax Credit to encourage angel investing by wealthy West Virginians in start-up companies.
- Encourage entrepreneurial studies/efforts on campuses, align and coordinate various entrepreneurial support programs both on and off campuses, celebrate entrepreneurial success stories.
- Assist with building an innovation culture in West Virginia in which public and private sectors engage to promote economic diversification.



VISION 2015

## science and research council

### **Dr. Pamela Balch**

President  
West Virginia Wesleyan College

### **Brian Bell**

Vice President & General Manager  
Global Science and Technology Inc.

### **Keith Burdette**

Cabinet Secretary  
West Virginia Department of Commerce

### **Dr. Fred Butcher**

Vice President for Planning and Operations  
for Health Sciences, West Virginia University

### **Jack Carpenter**

President  
Kicking Stones Inc.

### **Dr. Bojan Cukic**

Professor of Computer Science and Electrical Engineering  
West Virginia University

### **Kay Goodwin**

Cabinet Secretary  
West Virginia Department of Education and the Arts

### **Dr. Paul L. Hill**

Chancellor  
West Virginia Higher Education Policy Commission

### **Dr. Fred King**

Interim Vice President for Research and Economic Development  
West Virginia University

### **Dr. John Maher**

Vice President for Research  
Marshall University

### **Dr. Jorea Marple**

Superintendent of Schools  
West Virginia Department of Education

### **Dr. Orlando McMeans**

Dean & Director  
Gus R. Douglass Institute  
West Virginia State University

### **Dr. Gary Rankin**

Chair of the Department of Pharmacology, Physiology and Toxicology  
Marshall University

### **Dr. Charles Somerville**

Dean of the College of Science  
Marshall University