



WEST VIRGINIA HIGHER EDUCATION
SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM)
WORKFORCE DEVELOPMENT PLAN

West Virginia Higher Education Policy Commission -
Division of Science and Research

2015

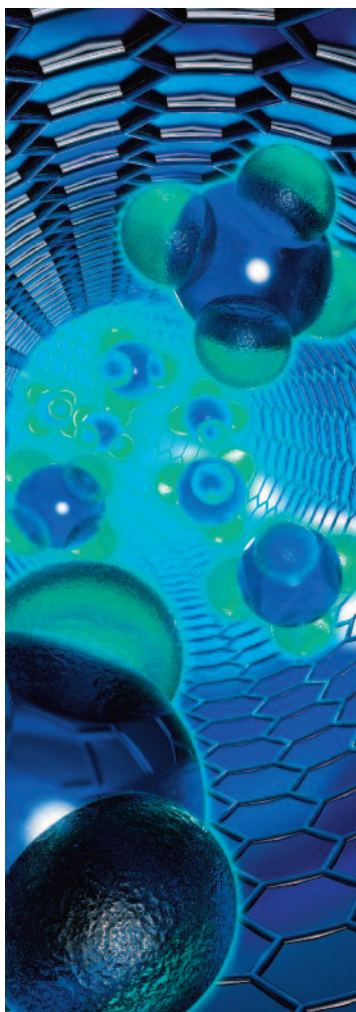


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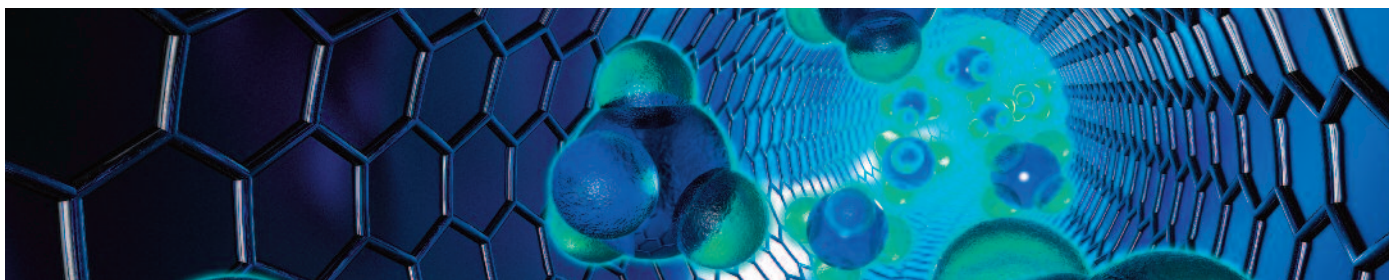
VISION By 2025, Science, Technology, and Engineering are WV's Leading Economic Growth Drivers Attracting Investments, Creating Jobs, and Improving Our Quality of Life

MISSION West Virginia's Higher Education Institutions will Prepare STEM Educators, Employees, Innovators, and Entrepreneurs to Fuel the State's Economy Well into the Future

CORE PRINCIPLES



- **SERVE** as a link between higher education and workforce and economic development needs and priorities in West Virginia
- **PREPARE** knowledgeable, proficient and engaged employees, educators, leaders and citizens across West Virginia
- **ADVANCE** economic development within the State, focusing on innovation and entrepreneurship
- **PARTNER** with business, industry and relevant private and public organizations across West Virginia
- **PROMOTE STEM** as an essential element for West Virginia's economic prosperity and quality of life



KEY OBJECTIVES AND GOALS

COLLABORATION AND ALIGNMENT

1. Actively engage and participate in Regional STEM Network HUBS as recommended by the West Virginia Council on Science, Technology, Engineering and Mathematics (STEM) starting when HUBS put into place
2. Strengthen Public Awareness of STEM as recommended by West Virginia Council on Science, Technology, Engineering and Mathematics (STEM)
3. Encourage collaboration among different higher-ed institutions and among higher education institutions and community colleges, K-12 schools, state agencies, non-profit economic development groups, and business and industry starting September 1, 2015

EDUCATION AND TRAINING

1. Increase the number of BS, MS, and PhD graduates in STEM fields from WV colleges and universities by at least 5% each year starting in 2018
2. Increase the number of highly qualified and prepared K-12 STEM teachers from WV colleges and universities by at least 10% each year starting in 2018
3. Tailor educational programs, learning activities, and other initiatives to emphasize critical current and projected industry sectors (energy, natural gas, petrochemical, biotechnology, advanced manufacturing, nanotechnology starting with Fall semester 2016

INNOVATION AND ENTREPRENEURSHIP

1. Establish guidelines, programs and activities to foster the formation of new businesses and job expansion in critical STEM areas and industry sectors starting January 1, 2017
2. Increase STEM-based research and entrepreneurial activities and programs at WV colleges and universities with an emphasis on critical current and projected industry sectors (energy, natural gas, petrochemical, biotechnology, advanced manufacturing, nanotechnology) starting by January 1, 2017
3. STEM faculty at all WV colleges and universities have opportunities to be rewarded for entrepreneurial activities and innovation in promotion and tenure considerations by January 1, 2017 (from Vision 2025: People Development Goal 2)



KEY OBJECTIVES

Collaboration and Alignment

SMART GOAL 1

Actively engage and participate in Regional STEM Network HUBS as recommended by the West Virginia Council on Science, Technology, Engineering and Mathematics starting when HUBS put into place

ACCOUNTABILITY

Jan Taylor

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, all citizens within our state need to be informed and educated about the importance of not only STEM but also research and innovation in creating high-skilled, well-paying jobs. Since this is also a focus and goal of Vision 2025: The WV Science and Technology Strategic Plan, that goal will be used for this plan to provide not only alignment but also increased efficiency and productivity.

MEASUREMENT

Participation and engagement by appropriate HEPC or HEPC system personnel in Regional STEM Network HUBS

IMPLEMENTATION PLANS

1. Contact Charles Patton (chair of WV Council on STEM), Governor's Office, or other appropriate groups or individuals to inform of this plan and goal and the desire to be fully engaged by September 1, 2015
2. If needed, assist in development of Regional STEM Network HUBS, starting after September 1, 2015
3. Appoint at least one individual from the HEPC system in each HUB region to participate and engage in that particular STEM Network HUB, starting after HUBS are kicked off or when appropriate
4. Appoint one key STEM Network HUB liaison from each institution to participate in regional HUBS or at least interact with HUBS after Networks announced
5. Develop Workforce Development Training Database for use by Regional HUBS and other groups by December 31, 2015 (Jack Smith)
6. Monitor participation and engagement of HEPC personnel in each HUB and offer guidance, coaching, and resources as needed on an ongoing basis

DATE

July 2015

REVISED

KEY OBJECTIVES**Collaboration and Alignment****SMART GOAL 2**

Strengthen Public Awareness of STEM as recommended by West Virginia Council on Science, Technology, Engineering and Mathematics (STEM)

(Use Goal from Vision 2025 WV S&T Strategic Plan: Increase WV public's understanding of the value of STEM and research by 5% annually starting January 1, 2016)

ACCOUNTABILITY

Amanda Ramey

**RATIONALE OR
BRIEF BACKGROUND**

To achieve our vision for prosperity in West Virginia, all citizens within our state need to be informed and educated about the importance of not only STEM but also research and innovation in creating high-skilled, well-paying jobs. Since this is also a focus and goal of Vision 2025: The WV Science and Technology Strategic Plan, that goal will be used for this plan to provide not only alignment but also increased efficiency and productivity.

MEASUREMENT

2016 baseline to be determined via survey

Baseline numbers to increase by 5% via subsequent surveys

**IMPLEMENTATION
PLANS**

1. Select survey method and/or survey firm by September 30, 2015
2. Develop final survey questions by November 30, 2015
3. Conduct a random baseline survey of the WV population in January 2016
4. Analyze data and, if appropriate, use to inform other activities, including legislative and public relations activities
5. Conduct follow-up, random survey of WV population in January of each year
6. Analyze data each year and make plans to increase understanding and awareness, also using data to inform other activities

DATE

July 2015

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KEY OBJECTIVES

Collaboration and Alignment

SMART GOAL 3

Encourage collaboration among different higher-ed institutions and among higher education institutions and community colleges, K-12 schools, state agencies, non-profit economic development groups, and business and industry starting September 1, 2015

ACCOUNTABILITY

Jan Taylor

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development and education. Fortunately, other organizations and initiatives are concentrated on this area already, but to achieve overall success in the most efficient and productive manner, we need to collaborate across all activities and sectors and among all organizations.

MEASUREMENT

Collaboration of higher-ed institutions with various groups as measured by participation and engagement in relevant activities, including Regional STEM Network HUBS, but also conferences, programs and other workforce initiatives and activities

IMPLEMENTATION PLANS

1. Notify appropriate higher-ed leaders, professors and others of this plan and desire for increased collaboration in STEM workforce initiatives and activities by October 1, 2015
2. Identify key STEM workforce initiatives and activities underway or planned throughout the HEPC system by December 31, 2015
3. Evaluate collaboration in key STEM workforce initiatives and activities (number of participating institutions, community colleges, K-12 schools, state agencies, non-profit economic development groups, and business and industry groups and individuals) by March 1, 2016
4. Provide evaluation (or data) to key higher-ed leaders and others with recommendations for increased activity and collaboration by May 1, 2016
5. Continue to monitor key initiatives and activities and encourage participation and collaboration where appropriate on an ongoing basis

DATE

July 2015

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**KEY OBJECTIVES****Education and Training****SMART GOAL 1**

Increase the number of BS, MS, and PhD graduates in STEM fields from WV colleges and universities by at least 5% each year starting in 2018

ACCOUNTABILITY

Paul Hill

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development and education across all sectors, disciplines, and levels. In fact, human capital is one of the most critical elements for successful economic development and prosperity, and STEM-based education is a key component of developing and driving human capital.

MEASUREMENT

Baseline: Three-year average of BS, MS, and PhD graduates in STEM fields from 2015-2017

Measure: Annual 5% increase in BS, MS, and PhD graduates in STEM fields starting in 2018

IMPLEMENTATION PLANS

1. Identify individual or group to develop a plan for increasing STEM graduates by December 31, 2015
2. Identify key HEPC personnel or institution leaders/liaisons to participate in or at least provide feedback and guidance in planning by December 31, 2015
3. Develop plan to increase STEM graduates by July 31, 2016, taking into account things like PROMISE and HEG Scholarships, possible new STEM PROMISE or similar STEM-based scholarships, graduate fellowships, and historically under-represented minorities
4. Obtain feedback and buy-in of plan from key HEPC staff and groups and key leaders of higher-ed institutions by September 30, 2016
5. Begin implementation of plan by October 31, 2016
6. Monitor ongoing progress and make needed changes as needed

DATE

July 2015

REVISED





KEY OBJECTIVES

Education and Training

SMART GOAL 2

Increase the number of highly qualified and prepared K-12 STEM teachers from WV colleges and universities by at least 10% each year starting in 2018

ACCOUNTABILITY

Paul Hill

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development and education across all sectors, disciplines, and levels. Human capital is one of the most critical elements for successful economic development and prosperity, and STEM-based education is a key component of developing and driving human capital. Highly qualified teachers are needed to prepare our kids and grandkids in all STEM fields at all levels well into the future.

MEASUREMENT

Baseline: Three-year average of K-12 teachers graduating in STEM fields from 2015-2017

Measure: Annual 10% increase in K-12 teachers graduating in STEM fields starting in 2018

IMPLEMENTATION PLANS

1. Identify individual or group to develop a plan for increasing K-12 STEM teachers graduating from WV institutions by December 31, 2015
2. Identify key HEPC personnel or institution leaders/liaisons to participate in or at least provide feedback and guidance in planning by December 31, 2015
3. Develop plan to increase K-12 STEM teachers graduating from WV institutions by July 31, 2016, taking into account programs like TREK (Teacher Research Experience for advancing Knowledge)
4. Obtain feedback and buy-in of plan from key HEPC staff and groups and key leaders of higher-ed institutions by September 30, 2016
5. Begin implementation of plan by October 31, 2016
6. Monitor ongoing progress and make needed changes as needed

DATE

July 2015

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KEY OBJECTIVES**Education and Training****SMART GOAL 3**

Tailor educational programs, learning activities, and other initiatives to emphasize critical current and projected industry sectors (energy, natural gas, petrochemical, biotechnology, advanced manufacturing, nanotechnology) starting with Fall semester 2016

ACCOUNTABILITY

Jan Taylor

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development and education. However, much of our attention should be focused on the most prevalent and important industrial sectors in the state. Tailoring our educational programs, activities, and initiatives on those key sectors will help prepare the workforce needed across the state and will better engage industry partners.

MEASUREMENT

Number of new and ongoing educational programs, learning activities, and other initiatives that emphasize critical current and projected industry sectors

IMPLEMENTATION PLANS

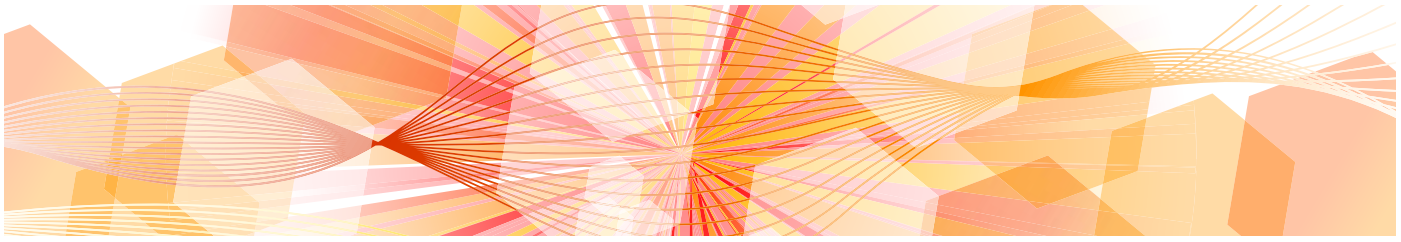
1. Identify individual or group to lead this activity by September 1, 2015
2. Identify key HEPC personnel or institution leaders/liaisons to participate in or at least provide feedback and guidance by October 30, 2015
3. Identify number of current educational programs, learning activities, and other initiatives that emphasize critical current and projected industry sectors both system-wide and at individual institutions by December 31, 2015
4. Develop plan to increase the number of current educational programs, learning activities, and other initiatives that emphasize critical current and projected industry sectors by April 30, 2016
5. Obtain feedback and buy-in of plan from key HEPC staff and groups and key leaders of higher-ed institutions by July 31, 2016
6. Begin implementation of plan by August 15, 2016
7. Monitor ongoing progress and make changes as needed

DATE

July 2015

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KEY OBJECTIVES **Innovation and Entrepreneurship**

SMART GOAL 1 Establish guidelines, programs and activities to foster the formation of new businesses and job expansion in critical STEM areas and industry sectors starting January 1, 2017

ACCOUNTABILITY Jan Taylor

RATIONALE OR BRIEF BACKGROUND To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development, including increasing innovation and entrepreneurship at our universities and other institutions. Although that can occur in any STEM field, it is critical that we concentrate most of our resources on STEM areas and industry sectors that are most important or existing strengths in West Virginia.

MEASUREMENT The establishment of guidelines, programs and activities to foster new businesses and job expansion

IMPLEMENTATION PLANS

1. Survey HEPC and higher-ed institutions to determine existing guidelines, programs and activities that foster the formation of new businesses and job expansion in critical STEM areas and industry sectors by January 31, 2016
2. Share and promote key programs and activities throughout the HEPC system and with other key stakeholder groups throughout the state starting March 31, 2016
3. Identify gaps in key STEM areas, industry sectors, and geographic regions and develop plans to close those gaps by December 31, 2016, including, for example, broadening or copying existing programs and activities or creating new ones
4. Include more commercialization opportunities in EPSCoR, RII, and related activities, programs, and funding starting January 1, 2017
5. Establish basic guidelines for major research institutions and PUIs for fostering the formation of new businesses and job expansion in critical STEM areas and industry sectors by July 31, 2017

DATE July 2015

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KEY OBJECTIVES**Education and Training****SMART GOAL 2**

Increase STEM-based research and entrepreneurial activities and programs at WV colleges and universities with an emphasis on critical current and projected industry sectors (energy, natural gas, petrochemical, biotechnology, advanced manufacturing, nanotechnology) starting by January 1, 2017

ACCOUNTABILITY

Jan Taylor

RATIONALE OR BRIEF BACKGROUND

To achieve our vision for prosperity in West Virginia, we must focus on STEM-based economic development, including increasing research and entrepreneurship at our universities and other institutions. Although that can occur in any STEM field, it is critical that we concentrate most of our resources on critical current and projected industry sectors.

MEASUREMENT

Baseline: Amount of research (\$) and number of entrepreneurial activities and programs at WV colleges and universities, both total and in critical sectors

Measure: Increase in amount of research (\$) and number of entrepreneurial activities

IMPLEMENTATION PLANS

1. Survey WV institutions to determine current plans for increasing STEM-based research and entrepreneurial activities and programs and uncover any gaps that may exist by June 30, 2016
2. Develop plan for closing gaps and increasing STEM-based research and entrepreneurial activities and programs, especially in critical industry sectors, by December 31, 2016
3. Gather feedback and obtain buy-in for plan from institutions by March 31, 2017
4. Begin implementation of plan by June 1, 2017
5. Continue to monitor progress and modify plan as needed

DATE

July 2015

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KEY OBJECTIVES **Innovation and Entrepreneurship**

SMART GOAL 3 STEM faculty at all WV colleges and universities have opportunities to be rewarded for entrepreneurial activities and innovation in promotion and tenure considerations by January 1, 2017 (from Vision 2025)

ACCOUNTABILITY Paul Hill

RATIONALE OR BRIEF BACKGROUND STEM-based innovation and entrepreneurship are critical elements for WV's future economic and workforce development. In most regions, much of that innovation and entrepreneurial activity starts at colleges and universities. STEM faculty in WV, however, have little incentive to devote time to intellectual property (IP) development, commercialization, or technology transfer, because these activities are not traditionally considered in promotion and tenure decisions. Counting IP development toward faculty merit, promotion, and tenure decisions will ensure that more faculty are encouraged to be entrepreneurial, and will help move West Virginia toward a more diverse, sustainable, and STEM-based innovation economy

MEASUREMENT All colleges and universities in WV have promotion and tenure guidelines in place that account for and reward entrepreneurial and innovation activities and accomplishments

IMPLEMENTATION PLANS

1. Summer 2015 – Gather promotion and tenure policies from all WV colleges and universities. Gather implementation guidelines from all WV STEM colleges or departments. Gather P&T guidelines from several peer and aspirational colleges and universities in states with vibrant STEM-based economic activity.
2. Fall 2015 – Appoint a committee of academic and research administrators to review existing policies and guidelines. This committee will be responsible for identifying the clearest and most progressive policies and guidelines. The committee will meet to recommend language to be included in all WV policies
3. Spring 2016 – HEPC personnel will make presentations to Boards of Governors and Faculty Senates to present proposed changes to policy and seek comment.
4. Fall 2016 – All Boards of Governors of West Virginia colleges and universities will be asked to consider, amend and adopt policies that they deem to be appropriate for their institution

DATE July 2015

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AFTERWORD

Importance of West Virginia Higher Education STEM Workforce Development Plan

Public higher education plays a vital role in improving economic opportunity and quality of life in West Virginia. The state's colleges and universities prepare the workforce of today and tomorrow while also developing new technologies and innovations along with entrepreneurs and innovators who start new companies and drive economic growth.

As Governor Earl Ray Tomblin stated at the announcement of the West Virginia Council on Science, Technology, Engineering and Mathematics (WV Council on STEM), "It is critical for us to prepare our students, today, for the jobs of tomorrow by increasing interest in science, technology, engineering and math. Throughout the next five years, economic development opportunities in our state will require a strategic expansion of STEM workforce availability."

In fact, the report from the WV Council on STEM included the following relevant observation: of 25,000 expected new STEM jobs in WV by 2018, 14,000 are expected to require a BS or higher degree with 3,000 of those requiring graduate degrees.

Projections and observations nationwide point to the critical need for both STEM workers and STEM innovation. For example, in a report from the U.S. Department of Commerce Economics and Statistics Administration, authors reported:

- STEM workers drive our nation's innovation and competitiveness by generating new ideas, new companies and new industries
- Over the past 10 years, growth in STEM jobs was three times as fast as growth in non-STEM jobs
- STEM occupations are projected to grow by 17.0 percent from 2008 to 2018, compared to 9.8 percent growth for non-STEM occupations
- STEM workers command higher wages, earning 26 percent more than their non-STEM counterparts

The plan above — the West Virginia Higher Education STEM Workforce Development Plan — aligns well with both Vision 2025: The WV Science and Technology Strategic Plan and the recommendations outlined by the WV Council on STEM. All three plans, along with other STEM initiatives across the state, will play critical roles in driving the state's economic growth and providing a higher quality of life well into the future.