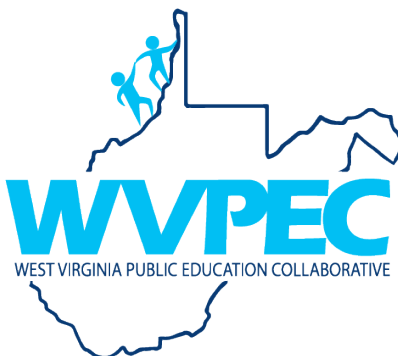# FOCUS FORWARD

PREPARING TODAY FOR THE WEST VIRGINIA OF TOMORROW
SEPTEMBER 16, 2019

IS WEST VIRGINIA READY FOR THE ERA OF BIG DATA? WHAT WE NEED TO KNOW TO STRENGTHEN OUR FUTURE.

CLAUDE WORTHINGTON BENEDUM FOUNDATION

WVPEC
WEST VIRGINIA PUBLIC EDUCATION COLLABORATIVE

WEST VIRGINIA FORWARD

Dear Focus Forward Participants,

The West Virginia Public Education Collaborative, WV Forward and the Claude Worthington Benedum Foundation are pleased to welcome you to our second annual Focus Forward: Preparing Today for the West Virginia of Tomorrow symposium.

Building on the success of the inaugural 2018 Focus Forward event that examined how machine learning and artificial intelligence will impact future jobs and required skills, we are reconvening to address how big data will transform West Virginia's economy, education system, and workforce. Today's symposium will bring together thought leaders and stakeholders to discuss how our education system can best prepare our students to drive West Virginia's economy and succeed in an evolving workforce.

What is big data and why does it matter to West Virginia? How do entrepreneurs use big data to innovate? How is education transforming in the era of big data? Today's sessions will address these questions and more. Our panelists will draw upon their vast expertise and range of experiences to share unique perspectives on these key topics and confront the game-changing effects of big data.

We challenge each of you to synthesize today's information and viewpoints in order to help us identify opportunities and brainstorm actionable next steps—policies, initiatives and collaborations—towards West Virginia's promising future. Focus Forward will truly be a success if innovative ideas are brought forward and meaningful partnerships are forged.

We want to thank our outstanding Focus Forward planning team—Josh Cook, West Virginia Forward; Jim Denova, Benedum Foundation; Katie Farmer, West Virginia University; Jen Giovannitti, Benedum Foundation; Rocky Goodwin, West Virginia Forward; Mary Hunt, Benedum Foundation; Maggie McDonald, West Virginia Public Education Collaborative; and Sara Payne Scarbro, Marshall University—for their dedication to planning this event and serving as champions for our state.

Thank you all for your support and commitment to creating a prosperous future for West Virginia.

Sincerely,

Donna Hoylman Peduto   Gayle Manchin
Executive Director   Chair
WV Public Education Collaborative   WV Public Education Collaborative

AGENDA

11:30 | WELCOME

- Dr. E. Gordon Gee, President, West Virginia University
- Dr. Jerome Gilbert, President, Marshall University

11:40-12:30 | THE BROAD PICTURE - WHAT IS BIG DATA?

What exactly is big data and how will it affect the ways we run our government, businesses, and education system? As the volume of data and information explodes, advanced technologies evolve, business models transform and innovation flourishes, explore national perspectives on the era of big data and how we use and share information is becoming the driver for economic growth and employment opportunities.

- Dr. Tom Mitchell, E. Fredkin University Professor, Machine Learning Department, School of Computer Science, Carnegie Mellon University
- Doug Perry, Deputy CIO, National Oceanic and Atmospheric Administration

12:45-1:45 | STATEWIDE ASSETS - WHY BIG DATA MATTERS TO WEST VIRGINIA

How is West Virginia confronting the game-changing effects of big data to ensure we can compete, grow and prosper in this new revolutionary age? Many organizations across the state are already beginning to harness the power of big data by leveraging West Virginia's unique assets.

- Facilitator: Dr. Brad Price, Professor, West Virginia University John Chambers College of Business and Economics
- Jim Estep, President and CEO, High Technology Foundation
- Dr. Victor Finomore, Director of Research, Development, and Data Analytics, Rockefeller Neuroscience Institute
- Drew Formica, Project and Program Manager, Leidos
- General James Hoyer, Adjutant General, West Virginia National Guard

1:45-2:45 | BIG DATA AND ENTREPRENEURSHIP

Opportunities are abundant for businesses in West Virginia and the surrounding region. With existing assets and structural advantages that make it an attractive destination for companies, particularly in the cyber, IT and artificial intelligence space, regional businesses are using and sharing big data to maximize performance every day.

- Facilitator: Jennifer Van Dam, Digital and Community Engagement Manager, Innovation Works
- Dr. David Dampier, Professor and Associate Dean for Research, Marshall University College of Information Technology and Engineering
- Dr. Mark DeSantis, CEO and Co-Founder, RoadBotics
- Michael Morehead, CEO, IstoVisio
- Kate Nichols, Founder and COO, GoJaneGo
- Christopher Scranton, Director, Nonprofit and Government Partnerships, Jobcase

3:00-4:00 | EDUCATION REVOLUTION IN THE ERA OF BIG DATA

How do we prepare students with the right skillsets to thrive in the era of big data as workforce needs evolve? Given advances in AI, machine learning and new technologies, the way we educate students will impact the success of West Virginia's future workforce. Building the right skillsets early on, coupled with personalized learning and classroom lessons on using and sharing big data most effectively are keys to long-term success.

- Facilitator: Dr. Scott Beard, Provost, Shepherd University
- Al Lambert, Assistant Chief Scout Executive, Boy Scouts of America
- Dr. Illah Nourbakhsh, Professor of Robotics and Director, CREATE Lab, Carnegie Mellon University
- Dr. Steve Paine, State Superintendent of Schools, West Virginia Department of Education
- Dr. Rebecca Wolfe, Vice President of Impact and Improvement, KnowledgeWorks

4:00-5:00 | WEST VIRGINIA'S BIG DATA CHALLENGES AND OPPORTUNITIES

Before the day concludes, we will discuss the most pressing questions raised throughout the day and concrete takeaways.

- Jen Giovannitti, President, Claude Worthington Benedum Foundation
- Dr. Illah Nourbakhsh, Professor of Robotics and Director, CREATE Lab, Carnegie Mellon University

SPEAKER BIOS

DR. TOM MITCHELL, CARNEGIE MELLON UNIVERSITY

Tom M. Mitchell is the Founders University Professor at Carnegie Mellon University, where he founded the world's first Machine Learning Department. His research lies in machine learning, artificial intelligence, cognitive neuroscience, and the impact of AI on society. Mitchell recently co-chaired a U.S. National Academies study on "Information Technology, Automation and the U.S. Workforce," and has testified to the House Subcommittee on Veteran's Affairs regarding potential uses of Artificial Intelligence in the VA. He is a member of the U.S. National Academy of Engineering, the American Association of Arts and Sciences, and is Past President of the Association for the Advancement of Artificial Intelligence. In 2015 he was awarded an Honorary Doctor of Laws Degree from Dalhousie University for his contributions to machine learning and cognitive neuroscience.

DOUG PERRY, NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Douglas Perry became the National Oceanic and Atmospheric Administration (NOAA) Deputy Chief Information Officer in July 2016 bringing 26 years of professional experience in engineering and information technology. As Deputy CIO, Mr. Perry is responsible for enabling NOAA's earth observation mission via effective, efficient delivery of information technology products and services. Mr. Perry served for more than thirteen years as an Electronics Engineer and project manager for the Office of Marine and Aviation Operations and was responsible for a variety of ship conversion projects and technology initiatives, including unique shipboard electronics, data acquisition, telecommunications and IT systems. Mr. Perry has been awarded the U.S. Department of Commerce Bronze Medal on three occasions.

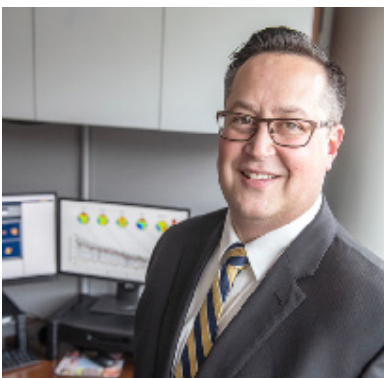## DR. BRAD PRICE, CHAMBERS COLLEGE OF BUSINESS AND ECONOMICS

Dr. Brad Price is an Assistant Professor in the Department of Management Information Systems at West Virginia University's John Chambers College of Business and Economics, where he teaches in the Business Data Analytics programs. His research focuses on developing statistical machine learning methods that have applications in business and healthcare. Dr. Price's research has been published in top journals in statistics and machine learning. He has also won various awards for both teaching and research. Dr. Price obtained his Ph.D. in Statistics from the University of Minnesota, is a graduate of WVU, and is a native of Madison, WV.

JIM ESTEP, HIGH TECHNOLOGY FOUNDATION

James L. Estep has served as President and Chief Executive Officer of the High Technology Foundation since June of 2000. The High Technology Foundation's mission is to serve as a catalyst for the growth of a regional knowledge sector. The flagship of the High Technology Foundation efforts is development of the I-79 Technology Park. Under Mr. Estep's leadership, the I-79 Technology Park has expanded to almost 400 acres and over 800,000 square feet of Class A office and lab space. Mr. Estep's recruitment efforts at the park have established a strong basis for a knowledge sector business case in West Virginia. Since 2018 alone, contracting opportunities at the I-79 Technology Park have exceeded $650 million.

DR. VICTOR FINOMORE, ROCKEFELLER NEUROSCIENCE INSTITUTE

Dr. Victor Finomore is the Director of Research, Development, and Data Analytics at West Virginia University's Rockefeller Neuroscience Institute. Prior to joining WVU, Dr. Finomore served as Engineering Research Psychologist at the U.S. Air Force Research Laboratory and United States Air Force Academy where he focused on multimodal displays, human performance, neuroergonomics, and advanced technology integration. His role at the RNI is to ensure seamless integration of resources to foster innovative research and development across the basic, applied, and clinical research enterprise in order to improve lives through advances in brain health.

DREW FORMICA, LEIDOS

Drew is the Site Manager and Director of Engineering for the Leidos Software Center in Morgantown, WV. He has 17 years of experience architecting and developing software solutions in both the military Command and Control arena, as well as the Healthcare domain. Drew has won Leidos Achievement awards for Innovation and Collaboration and is a co-architect of the 2019 Edison Award winning Leidos Enterprise Application Framework (LEAF). Drew is a native West Virginian with a BS in Computer Science from Wheeling Jesuit University and a MS in Software Engineering from WVU.

GENERAL JAMES HOYER, WEST VIRGINIA NATIONAL GUARD

Major General James A. Hoyer assumed the duties as The Adjutant General, West Virginia Joint Forces Headquarters – West Virginia on 1 February 2011. As the Adjutant General, State of West Virginia, he provides command guidance and vision to the West Virginia Army and Air National Guard of more than 6,500 Citizen Soldiers and Airmen. He provides the overall supervision of the day to day operations and management of the readiness, fiscal, personnel, equipment and the real property resources of the agency.

JENNIFER VAN DAM, INNOVATION WORKS

Jennifer serves as Digital & Community Engagement Manager at Innovation Works (IW). In this role, Jenn manages the online presence for the IW programs, develops messaging and branding for the organization, designs marketing collateral, and works with IW and Riverfront portfolio companies to develop their marketing strategies. Another piece of Jenn's role is engaging with the community, she does this through outreach, relationship building, collaboration, and events. She is also a co-host of Caffeinated Innovation, IW's podcast.
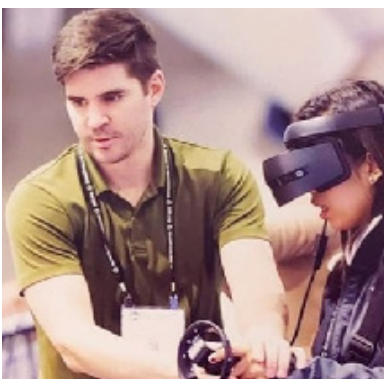
DR. DAVID DAMPIER, MARSHALL UNIVERSITY

Dr. Dave Dampier is Associate Dean for Research in the College of Information Technology and Engineering at Marshall University. Prior to Marshall, Dr. Dampier was Chair of the Department of Information Systems and Cyber Security at U.T. San Antonio and founding director of the Distributed Analytics and Security Institute at Mississippi State. He has 70 peer reviewed publications and ~$50M in external funding. Before academia, he spent 20 years as an Army Automation Officer. He has a Ph.D. in Computer Science from the Naval Postgraduate School. His research interests are in Cyber Security, Digital Forensics and applications of Software Engineering.

DR. MARK DESANTIS, ROADBOTICS

Mark F. DeSantis is CEO of RoadBotics, an AI platform for assessing roads and roadways infrastructure. He was Executive Chairman of kWantix, a quant hedge fund, CEO of kWantera, a GE Ventures-backed energy trading company and CEO of Think Through Learning, an online tutoring company, as well as US Managing Director of ANGLE Technology, PLC. Mark is has a dual appointment as an Adjunct Professor in both Heinz College and at Carnegie Mellon University. He is also Executive in Residence of Entrepreneurship at Duquesne University. He holds a BA and MBA from the University of Dayton, an MS in Technology Management from The American University and a PhD in Public Policy at George Mason University.

MICHAEL MOREHEAD, ISTOVISIO

Michael Morehead is the cofounder and CEO of syGlass, a small software startup focused on visualization and annotation of very large volumetric data sets in virtual reality. He holds a Master of Science in computer science and spent six years embedded in the WVU Rockefeller Neuroscience Institute working on various research topics, including image processing, 3D segmentation, and applying shape-context machine learning to neuron morphology.

KATE NICHOLS, GOJANEGO

Kate Nichols has grown national distribution of product lines at 20%+ year-over-year for the past six years. Her expertise in business development has contributed over $70 million dollars in revenue during that time period. She has also been an analytical liaison for L'Oreal Paris, identifying and developing opportunities for Sales and Marketing. Kate is currently an NYU Digital Marketing and Strategy Certification Candidate.

CHRISTOPHER SCRANTON, JOBCASE

Christopher Scranton is the Director of Nonprofit & Government Partnerships at Jobcase. He leads Jobcase Cares, the company's initiative to provide big data technology to support collaborations with nonprofit, government, and industry partners that empower American workers. He led the initial Jobcase collaborations with West Virginia partners, including the support of WV's largest job fair and the launch of the free software coding training program, NewForce. Before joining Jobcase, Christopher was Senior Manager for Big Data & Technology Initiatives for the Massachusetts Technology Collaborative. He led the Massachusetts Big Data Initiative- the Commonwealth's effort to support and grow business activity, research, collaboration, and innovation in big data, open data, and analytics.

DR. SCOTT BEARD, SHEPHERD UNIVERSITY

 Dr. Scott Beard is the Provost at Shepherd University, where he previously held positions as Associate Provost and Graduate Dean. He heads an innovative academic team of directors and programs ranging from Appalachian Studies and International Affairs, at the George Tyler Moore Center for the Civil War. He is a noted performing artist, having performed in more than 10 countries, was runner up for West Virginia Professor of the Year (2009) and was the WVMTA Music Teacher of the Year (2006). He is the author of four music anthologies and a soon to be released textbook form Oxford University Press.

AL LAMBERT, BOY SCOUTS OF AMERICA

Alan F. "Al" Lambert is the Assistant Chief Scout Executive, National Director of Outdoor Adventure. His program has been described as "A well-planned program, delivered by a trained leader, with a strong outdoor program, supported by a good commissioner attracts and retains youth." Al started as an Exploring Executive in Chicago, IL in 1980. Since then, he has served as the Deputy Scout Executive in the National Capital Area Council in Washington, DC. He was selected as the Regional Director for the Central Region in 2010. Al graduated from Salem College, WV with a BA in Youth Agency Administration and is now serving on the board of the Non-Profit Leadership Alliance.

DR. ILLAH NOURBAKHSH, CARNEGIE MELLON UNIVERSITY

Dr. Illah R. Nourbakhsh is K&L Gates Professor of Ethics and Computational Technologies at Carnegie Mellon University and director of the Community Robotics, Education and Technology Empowerment Lab. Illah is currently serving as CEO of Airviz Inc., which is dedicated to global empowerment regarding air quality. He has co-authored textbooks and popular literature, including Robot Futures. He is a trustee of the Claude Worthington Benedum Foundation, a trustee of Winchester Thurston School and Chairman of the Southwestern Pennsylvania Environmental Health Project. He is a World Economic Forum Global Steward and a senior advisor to The Future Society, Harvard Kennedy School, as well as RoboGlobal.

DR. STEVE PAINE, WEST VIRGINIA DEPARTMENT OF EDUCATION

Dr. Steven L. Paine is West Virginia's 31st Superintendent of Schools. He returned to that position in March 2017, after previously serving in the same capacity from 2005-2011. Under his leadership, West Virginia has been nationally recognized for its early childhood programs, child nutrition efforts, graduation rates and career technical education programs. Paine joined the West Virginia Department of Education in 2003 as Deputy State Superintendent of Schools after serving as the Superintendent of Morgan County Schools. Paine earned his undergraduate degree from Fairmont State College and obtained his master's in educational administration, and a doctorate in educational leadership both from West Virginia University.

DR. REBECCA WOLFE, KNOWLEDGEWORKS

Rebecca E. Wolfe is a leading national voice in the effort to achieve ambitious goals for equity and student readiness through learner-centered approaches. Dr. Wolfe oversees efforts that improve evidence-based program and policy initiatives to advance the field of personalized, competency-based learning. Dr. Wolfe has authored or co-authored numerous publications on student-centered learning, including a featured article in the September issue of The Learning Professionalmagazine and editing two books with Harvard Education Press. In 2018, she was recognized as the New England Secondary School Consortium's Regional Champion for being a "tireless leader in New England's effort to ensure high-quality learning experiences for all students across the region."

JEN GIOVANNITTI, CLAUDE WORTHINGTON BENEDUM FOUNDATION

Jen Giovannitti is the President and a Trustee of the Claude Worthington Benedum Foundation. Ms. Giovannitti has previously led strategic programs and community-based initiatives for seven years at the Federal Reserve Bank of Richmond, most notably in community investment, human capital, regional collaboration, and capital access. She emphasized the role of data-driven decision-making in regional projects. She formed the West Virginia Loan Fund Collaborative in 2012 to better understand the impact of small business lending in underserved communities. She has authored a variety of reports, publications, and opinion essays, and has applied her expertise broadly in rural development strategies.

A FOCUS FORWARD GLOSSARY

Artificial intelligence (AI): Chess-playing computers, self-driving cars, and smart personal assistants like Siri and Alexa are all examples of AI. Using AI, computers can be trained to accomplish specific tasks by processing large amounts of data and recognizing patterns in the data. Unlike humans, though, AI's expertise is narrow, and AI systems are only able perform clearly defined tasks.

Big data: Big data refers to the increasingly large and complex datasets that we are able to gather using today's technology. This could mean terabytes, petabytes, or even yottabytes (yep, that's a lot) of data. Many industries collect and analyze big data. NOAA sensors monitor the weather, scientists run computations using the Green Bank Telescope, the West Virginia Department of Tourism receives clickstream information on their ads: these are all examples of how big data is used in the state.

Blockchain: Blockchain is a new way to create a high-tech database that securely stores data and digital information with new, innovative properties.

Data Science: Data science combines multiple fields of work in statistics and computation with subject matter experts to create tools and make impact with data. Because there is such a wide array of data, the field of study based on big data, was created. Data science uses techniques like machine learning and AI to gather information and predict future behaviors and patterns.

Deep Learning: Deep learning is an artificial intelligence function that works and imitates the human brain. It does this to process data and create patterns for use in decision-making. Deep learning is used in fields such as computer visioning, speech recognition, natural language processing, audio recognition, social network filtering, machine translation, medical image analysis, all of which they have produced results comparable to and in some cases superior to human experts.

The Fourth Industrial Revolution: The Fourth Industrial Revolution, or Industry 4.0, is the technological revolution. Due to the rapid transformation of advanced technologies, innovation, AI and machine learning, the ways humans interact at work, in their daily lives and with each other is changing. An example would be a "smart factory," a factory that has 3-D printers, strong cybersecurity, and advanced industrial robots to help with production. Although the Revolution is still in the beginning stages, it is expected to impact the entirety of society by as early as 2030, as it is creating big changes in multiple ways at lightning speed.

Internet of Things (IoT): The Internet of Things is the interconnection through the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. Smartphones, wearable devices, headphones, coffeemakers, washing machines, lamps, scratch the surface.

Knowledge economy: The knowledge economy is an economy based on creating, analyzing and sharing knowledge and information. Its growth is dependent on the quality, quantity and accessibility of how this information is shared.

Machine learning: Machine learning is a branch of AI focused on developing new tools and algorithms that allow computers to learn from data, identify patterns, and make decisions with minimal human intervention. Using machine learning, computers aren't programmed to perform specific tasks—rather, they learn from data they're presented with. Google's new self-driving car uses machine learning on the road. TV and movie recommendations from Hulu and Netflix are an application of machine learning on the small screen.

Structured Data: Structured data organizes information in a tabular format with rows and columns, most commonly displayed as Excel spreadsheets.

Unstructured Data: Unstructured data displays information in many different forms, usually not compiled in a database, most commonly displayed through books, journals, health records, multimedia (audio, video, imagery), graphics, emails or websites.
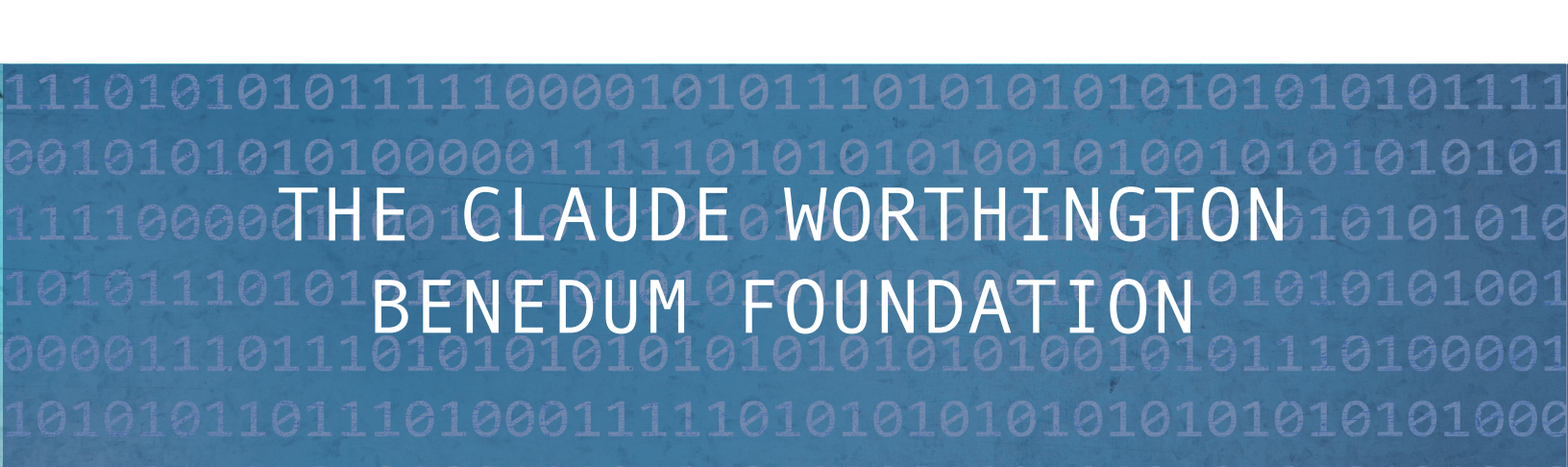
Citations available upon request.

THE WEST VIRGINIA PUBLIC EDUCATION COLLABORATIVE

CHAMPIONING PUBLIC SCHOOLS THROUGH OUTREACH AND INNOVATION.

The WVPEC is a non-partisan collaborative of diverse state and national leaders championing awareness and support of public schools through outreach, innovation, and convening of stakeholders to foster productive dialogue and respond rapidly to emerging issues P-20 in West Virginia and beyond.

To date, the WVPEC has sponsored three main events and initiatives, the annual Legislators' Forum, Focus Forward: Preparing Today for the West Virginia of Tomorrow, and Academic Spotlight, which have initiated a dialogue interweaving numerous views on education in our state while bringing together many different groups, including teachers, lawmakers, and the general public. The WVPEC is also spearheading initiatives to create an inventory of STEM activities in West Virginia, establish a West Virginia K-12 Speakers' Bureau that will connect educators and students with members of the workforce, and create and protect educational opportunities for girls and women across the state. Support for WVPEC activities is provided by the Claude Worthington Benedum Foundation and WVU, along with other generous donors.

THE CLAUDE WORTHINGTON BENEDUM FOUNDATION

ENCOURAGING HUMAN DEVELOPMENT IN WEST VIRGINIA AND SOUTHWESTERN PENNSYLVANIA THROUGH STRATEGICALLY PLACED CHARITABLE RESOURCES.

The Claude Worthington Benedum Foundation largely takes on the agenda of the people we serve. Our business is to help people help themselves. This is not intended to suggest that the Foundation's role is passive. To the contrary, we go out into the field and listen closely. We build strong and supportive relationships with grantees. We provide technical assistance. We broker ideas and institutions. We create partnerships. We undertake analyses of issues and problems and we promote public awareness of them. We help to build broad consensus for change. We seek to empower people to develop their own capacity and the capacity of their institutions to succeed. We leverage not only funds but interest, involvement, and commitment.

WEST VIRGINIA FORWARD

UNCOVERING THE BEST SOLUTIONS FOR ONE, UNITED WEST VIRGINIA.

A blueprint with a host of recommendations and ideas to advance West Virginia's economic future, West Virginia Forward began as an unprecedented collaboration between West Virginia University, the West Virginia Department of Commerce and Marshall University. Over time, this partnership has developed into a larger, statewide effort to identify West Virginia's unique assets and pair them with economic trends that will leverage growth and development opportunities to strengthen and diversify all regions of the state.

With a sharp focus on short-term and long-term objectives, and a refined vision, the partners are working alongside key stakeholders and experts across West Virginia and beyond. So far, innovative solutions and opportunities include advancing West Virginia's workforce, business climate, educational opportunities, community development, energy sector, cybersecurity, entrepreneurship and infrastructure.

NOTES

THANK YOU!

KEEP UP WITH US ONLINE:

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