



# **National Higher Education & Workforce Initiative**

## **Economic Growth Through High-skill, High-demand Workforce Development**

**UCF College of Engineering and Computer Science  
Dean's Advisory Board**

***Brian Fitzgerald, CEO***  
**November 13, 2015**

*Creating Solutions. Inspiring Action.®*

# Overview

The session will explore how:

- BHEF has created new modeling tools to sharpen strategy regarding philanthropy, policy, and practice
- BHEF has addressed workforce shortages in high-skill, high-demand fields using BHEF proven processes for strategic partnership development
- BHEF's program development in the application of emerging fields has produced both the "scientist" and the "enabled" graduate

# About the Business-Higher Education Forum

The Business-Higher Education Forum (BHEF) is a membership organization of Fortune 500 CEOs, college/university presidents, and other leaders who collaborate to promote innovation and enhance U.S. global competitiveness through its National Higher Education and Workforce Initiative.

## BHEF Mission

- BHEF members collaborate to increase baccalaureate attainment and improve alignment between higher education and the workforce by creating undergraduate pathways to produce a diverse, highly-skilled talent pool to meet demand in emerging fields.
- BHEF convenes business and academic leaders, promotes effective undergraduate program design and development to create workforce solutions, and provides guidance to increase the impact on baccalaureate outcomes.
- BHEF facilitates peer-to-peer engagement for its members and inspires peer leaders to act.

Shapes the National  
Agenda for Business &  
Higher Education  
Collaboration  
through Convenings

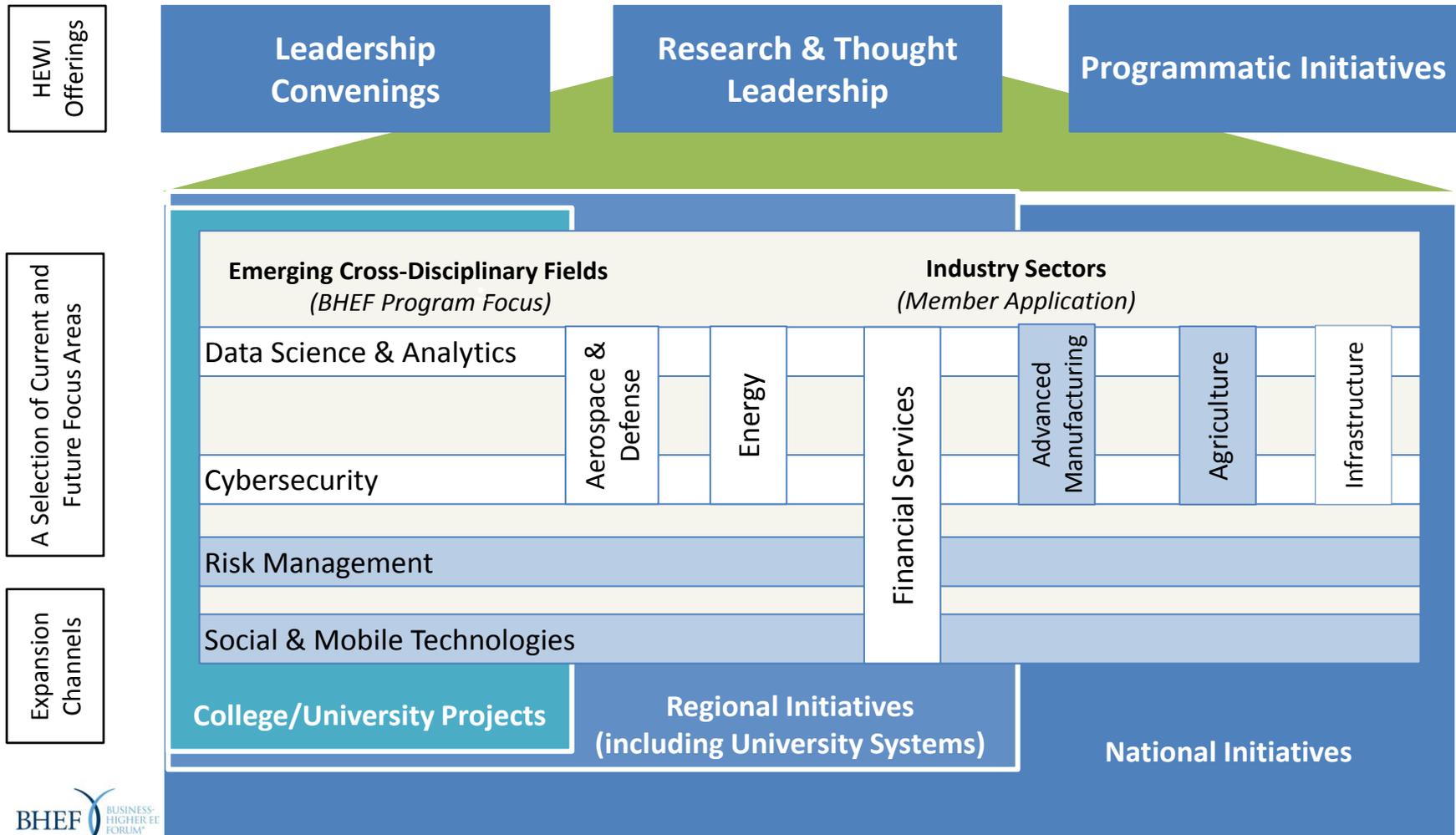
Influences Practice &  
Policy through  
Research & Thought  
Leadership

Addresses  
Workforce Needs  
through  
Programmatic Initiatives

# BHEF Strategy

## National Higher Education and Workforce Initiative Framework

Through HEWI, BHEF catalyzes regional market-driven projects in emerging cross-disciplinary fields in partnership with member academic institutions and companies in high-demand industries.



# Programmatic Initiatives

BHEF launches regional and national networks and supports business and higher education activities to equip students with the skills and competencies to meet employers' emerging talent needs.

## Launch and Support Networks

National Data Science Alliance

National Cybersecurity Network

New York City Data Science Task Force and Financial Services Industry Workforce Project

Greater Washington DC Cybersecurity Network

## Engage in BHEF's Data Science Work



# HEWI Highlights

**BHEF's regional and national networks support business and higher education activities that equip students with the skills and competencies to meet employers' emerging talent needs.**

- Facilitating launch of ~12 **business-higher education partnerships** producing 20 new academic programs and a nationally recognized process for **strategic business engagement**
- Coordinating **Undergraduate STEM Interventions with Industry (USI<sup>2</sup>) Consortium**, supporting five lead business-higher education partnerships, funded by the National Science Foundation
- Developing new undergraduate pathways for students in **cybersecurity** in Maryland, DC, and Virginia, funded by the Office of Naval Research and the Alfred P. Sloan Foundation
- Leading **Financial Services Industry Workforce Project**, bringing together CEOs to address critical workforce needs, beginning with data science and analytics at Baruch's Zicklin School of Business
- Launching NYC **Data Science Task Force**, funded by the Alfred P. Sloan Foundation

**BHEF's work is rooted in a deep, evidence-based understanding of the education & workforce challenges nationally and in regions across the country.**

# BHEF's deep analysis forms foundation for a sustained partnerships

**BHEF partners with academic and business members and utilizes a rigorous methodology to assess workforce needs, identify curricular gaps, and co-design programs and courses**

Components of BHEF's assessment and design methodology include:

- Modeling and Simulation
- Workforce Analysis
- Market Analysis/Peer Review
- Skills and Competency Mapping
- Gap Analysis of Existing Programs/Courses
- Co-design of Programs/Courses
- Generating Student Interest and Opportunities for Internships
- Creating Feedback Loop among Deans, Faculty, and Partners

## The U.S. STEM Education Model

The U.S. STEM Education Model allows users to simulate the impact of various scenarios designed to increase the number of students who pursue science, technology, engineering and mathematics (STEM) majors and careers.

### How to Simulate STEM Education Policy Decisions

The U.S. STEM Education Model begins in equilibrium, with no expected change to the annual number of STEM college graduates. This model allows you to simulate how various policy changes might be expected to affect this number.

### The Model Management Team

The U.S. STEM Education Model is managed through a partnership between the Raytheon Company, the Business-Higher Education Forum, and The Ohio State University. Email questions and comments to [bhef@bhef.com](mailto:bhef@bhef.com)

**Start Simulation**

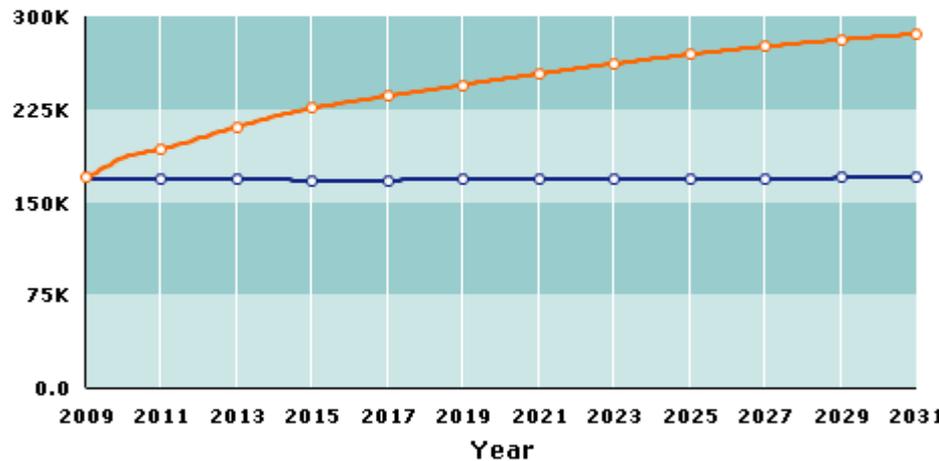


## Policy Scenario 3 Adopt Complimentary P-16 Education Approaches

This policy scenario examines how multiple policy scenarios combine to increase the number of college students earning STEM degrees.



STEM Students



- STEM College Graduates (Baseline)
- STEM College Graduates (Current Run)

The baseline shows the model at equilibrium, with a constant 13% annual attrition of all teachers and limited student participation in cohort programs.

But what if we adopted two policies, one to retain more STEM capable teachers and the other to increase student participation in college cohort programs?

**Run This Scenario**

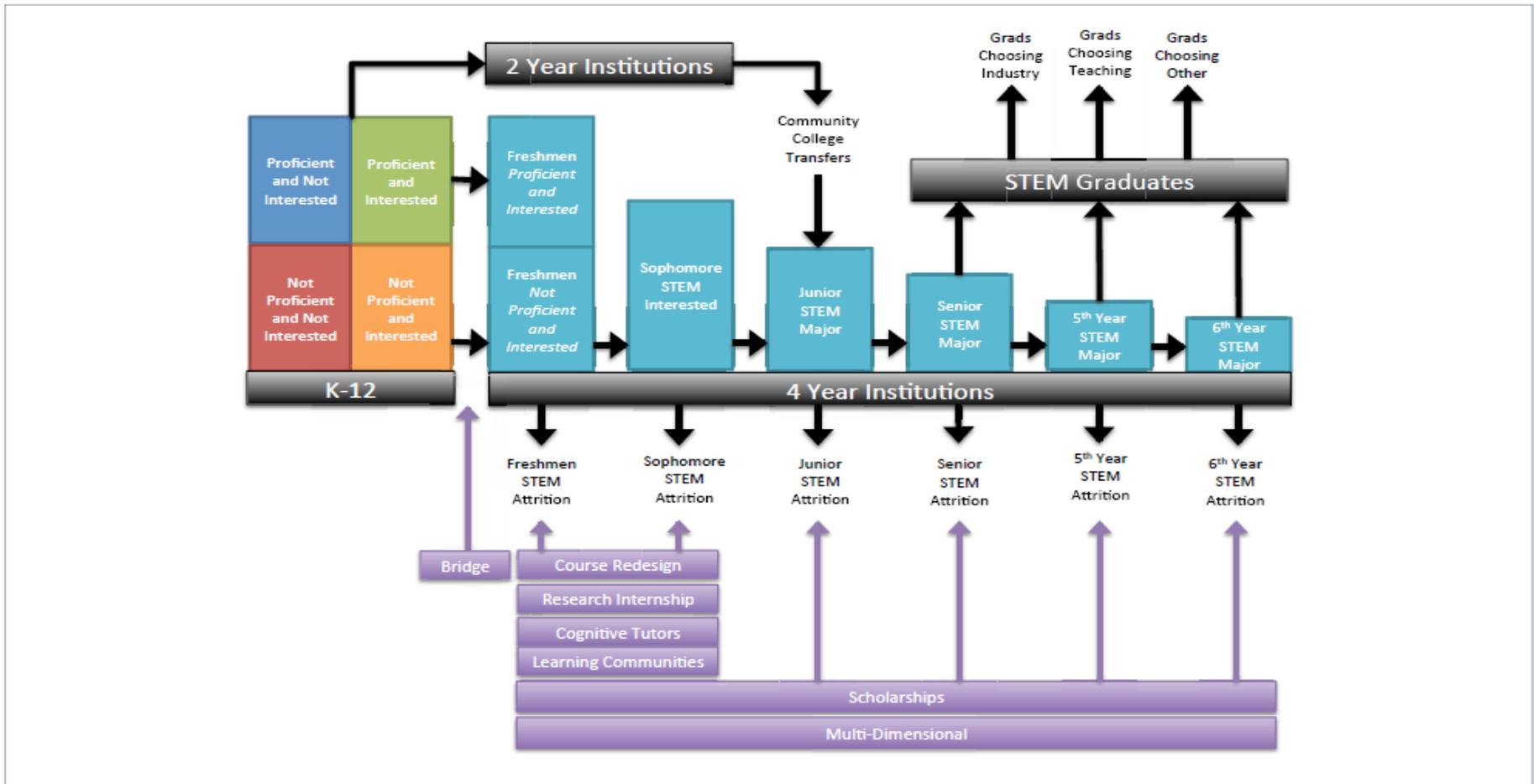
This scenario decreased the annual percentage of STEM capable teachers leaving a teaching position from 13% to 7% and increased student participation in cohort programs to 50%. As a result of the combined policy intervention, the model forecasts greater increase in STEM graduates than we would have seen from just one of the policy changes.

**Back**

# Relevant Findings from the BHEF STEM Education Model®

- Interest in STEM and proficiency in math are key and independent factors in student choice of STEM majors/careers
- Strengthening undergraduate education yields an early and significant return on investment
- Interventions such as student team/cohort learning can significantly increase student persistence in STEM fields

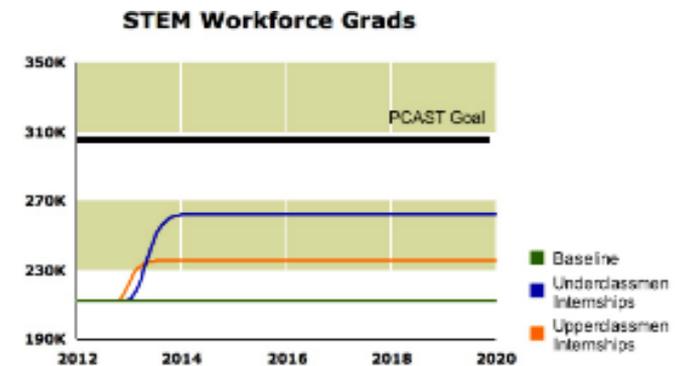
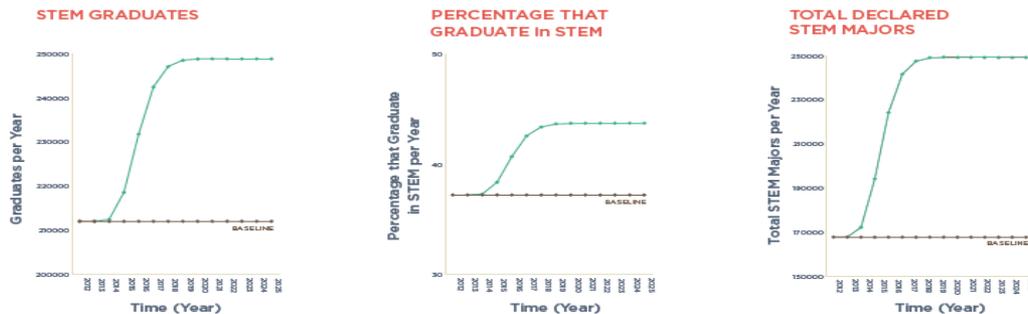
# Representation of the U.S. STEM Undergraduate Model<sup>®</sup>



# Strategies and Solutions

1. Focus interventions in the critical **first two years of college** of STEM undergraduate education
2. **Disruptive/systemic institutional interventions**, such as cognitive tutors, can lower per-student costs and improve retention
3. A strategy of employing **blended intervention types** (i.e. student-focused and institutional) creates synergistic effects
4. Single interventions alone at reasonable scale are not enough to reach PCAST's goal; **multidimensional programs** are required

**OUTPUTS** The model simulates effects of selected interventions and comparisons of interventions.



# Cybersecurity: Expansion

**Leverage the learning captured through successful implementation of projects and networks to expand the impact of BHEF's cybersecurity strategy.**

- First two projects launched at UMD and UMBC
- Expanded to entire University System of Maryland
- Launched new projects in California, Florida, Massachusetts, New York, Virginia
- Broadened Maryland network to include DC, Virginia, and Tidewater
- Created National Cybersecurity Network with over 100 partners
- Partnered with Burning Glass to understand regional workforce needs



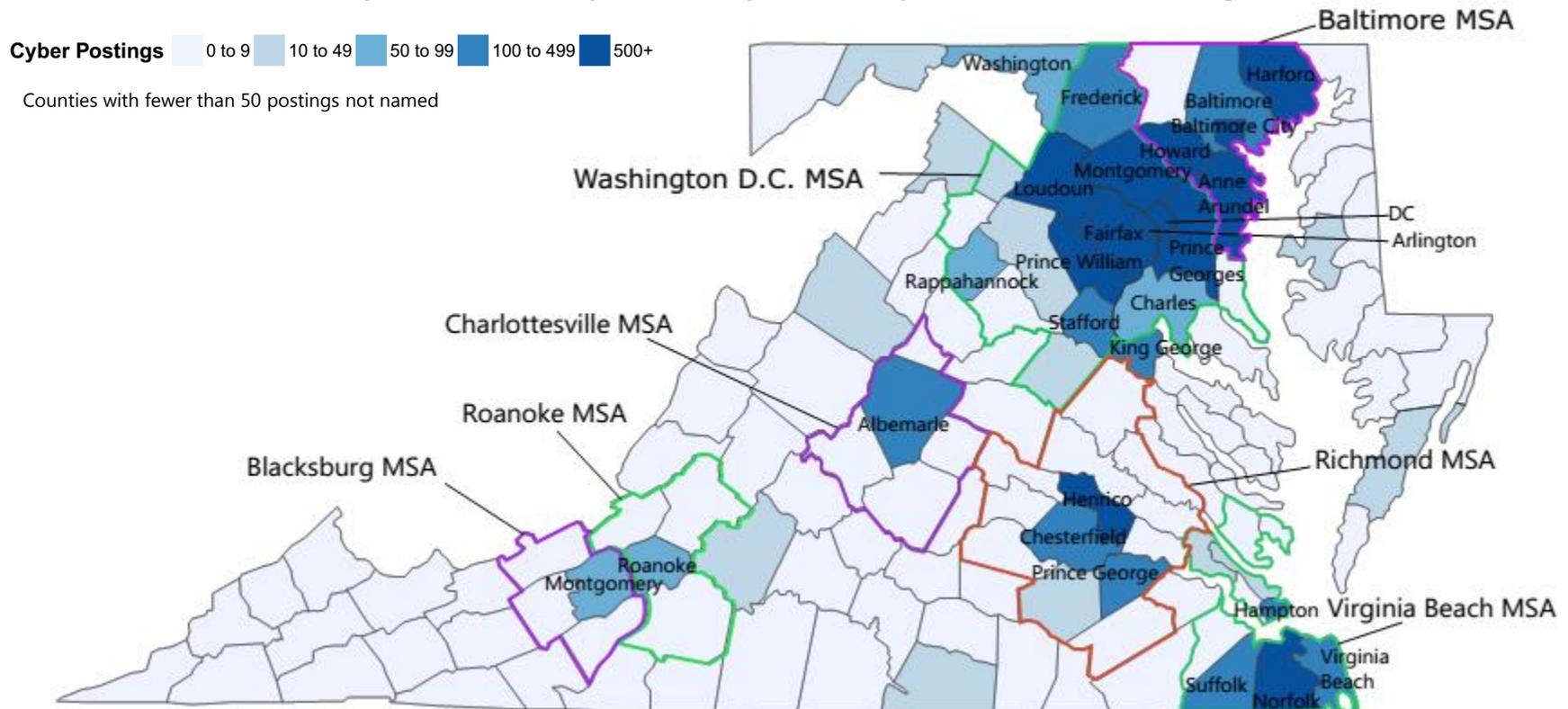
**ACES** ADVANCED CYBERSECURITY  
EXPERIENCE FOR STUDENTS



# Overview of Cybersecurity Jobs in the DMV Region

- Postings are concentrated in Washington DC, Baltimore, Richmond, and Virginia Beach metropolitan areas, with 70% of total postings in the Washington DC, MSA.
- Average posted salaries for cybersecurity jobs in the DMV Region were \$89,579, compared to \$84,385 for cybersecurity jobs nationally and \$82,471 for other IT jobs in the DMV Region.

## Cybersecurity Jobs by County in the DMV Region



# Geographic Summary Table

This summary details cybersecurity and networking postings by geography

Summary by Geography	Total Cybersecurity Postings (2014)	Total Networking Postings (2014)	Cybersecurity as Share of All IT	Networking as Share of All IT
<b>National</b>	198,627	597,696	 9%	 27%
<b>Capital Region (MD, VA &amp; DC) Combined</b>	33,087	53,333	 16%	 26%
<b>States</b>				
<b>Maryland (MD)</b>	9,437	17,799	 14%	 27%
<b>District of Columbia (DC)</b>	6,423	9,998	 16%	 25%
<b>Virginia (VA)</b>	17,227	25,536	 18%	 26%
<b>Metropolitan Statistical Areas</b>				
<b>Washington-Arlington-Alexandria, DC-VA-MD-WV</b>	22,774	34,161	 17%	 26%
<b>Baltimore-Towson, MD</b>	3,882	7,876	 13%	 27%
<b>Virginia Beach-Norfolk-Newport News, VA-NC</b>	1,530	2,601	 18%	 30%
<b>Richmond, VA</b>	1,320	2,827	 12%	 25%
<b>Charlottesville, VA</b>	131	366	 11%	 31%
<b>Hagerstown-Martinsburg, MD-WV</b>	116	293	 16%	 40%

# Unique Features of Local Demand

## Washington DC Metropolitan Area

- Washington DC has the largest demand for cybersecurity professionals of any city in the nation.
- Demand is heavily concentrated among professional services and defense contractors providing services to the federal government.
- Cybersecurity and related networking roles account for over 40% of all IT job demand.

## Richmond Metropolitan Area

- Demand for cybersecurity professionals in Richmond is strongest in the finance sector, in contrast to the other cities included in this report.
- Cybersecurity roles in the finance sector often have distinct training requirements such as a Certified Information Systems Auditor certification.

## Virginia Beach Metropolitan Area

- Demand for cybersecurity professionals in the Tidewater Region is heavily concentrated in the U.S. Navy and related defense contractors.
- Cybersecurity roles in the Tidewater region are more likely to call for a Security+ certification and are more likely to be cybersecurity specialists (as opposed to engineers, auditors etc.).

# Cybersecurity: Demand by Role

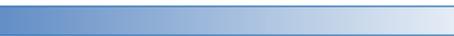
- Engineers and analysts are the most commonly demanded cybersecurity roles in Virginia.
- Virginia employers demand proportionally more cybersecurity engineers and specialists/technicians than national employers.

Title	% of Cybersecurity Postings	Number of Cybersecurity Postings (2014)	Comparison to National
Engineer	32%	3,607	
Analyst	18%	1,959	
Manager/Admin	17%	1,910	
Specialist/Technician	14%	1,577	
Architect	5%	498	
Consultant	2%	246	
Auditor	2%	207	

 : % of Cybersecurity jobs in this role in VA > % in the nation  
 : % of Cybersecurity jobs in this role in VA = % in the nation  
 : % of Cybersecurity jobs in this role in VA < % in the nation

# Cybersecurity: Demand by Industry Sector

- Professional Services & Defense and Finance are the leading industry sectors for cybersecurity professionals in Virginia.
- Compared to the nation, a higher proportion of cybersecurity demand in Virginia comes from the Professional Services & Defense and the Public Administration sectors, reflecting the concentration of professional services companies, government agencies and defense contractor jobs in the state.

Industry Sector	% of Cybersecurity Postings	Number of Cybersecurity Postings (2014)	Growth (2010-2014)	Comparison to National
<b>Prof. Services &amp; Defense*</b>	68%	11,758 	28%	
<b>Finance</b>	9%	1,522 	58%	
<b>Public Administration</b>	7%	1,206 	N/A	
<b>Information</b>	7%	1,126 	54%	
<b>Education</b>	3%	455 	118%	
<b>Health Care</b>	2%	256 	3%	
<b>Other Services</b>	1%	194 	-34%	
<b>Other</b>	4%	710 	-32%	

\*The Professional Services & Defense industry sector includes professional services firms such as Booz Allen Hamilton and ManTech, defense contractors such as General Dynamics and Northrop Grumman, the service divisions of computer manufacturers such as Hewlett Packard and Dell.

 : % of Cybersecurity jobs with this sector in VA > % in the nation  
 : % of Cybersecurity jobs with this sector in VA = % in the nation  
 : % of Cybersecurity jobs with this sector in VA < % in the nation

# BHEF Serving as Thought Leader for DSA Education

**BHEF is uniquely positioned to serve as the nation's thought leader for data science and analytics (DSA) education and workforce and build a vibrant community of engaged leaders to shape the education offerings linked with this emerging field.**

- Host the only Dedicated National DSA Education and Workforce Event
- Serve as the hub for national industry/higher education collaborations
  - National competency map(s)
  - Industry-validated courses and experiential learning opportunities
  - Leadership forum with leaders from business and higher education
- Support regional hubs and undergraduate/PSM program development
  - Support NYC through the Sloan grant
  - Work with partners in North Carolina, Ohio, and Florida to explore the creation of data science programs
- Explore DSA as it relates to the liberal arts degree
  - Create a deeper understanding of DSA literacy and enabled graduate

# NYC Region Data Science Task Force

**BHEF launched a city-wide task force in data science with the region's colleges and universities, companies, government agencies, and cultural institutions with the support of the Alfred P. Sloan Foundation. The task force will build undergraduate pathways in data science and analytics across a broad swathe of sectors with a focus on women and minorities.**

## **Goals:**

- **Identify and map** the competencies, skills, and knowledge for the broader data science workforce (e.g., data science-enabled professionals in selected sectors)
- Support the working group to **develop a repository** of undergraduate data science resources (e.g., data sets, exercises, and student work experiences)
- Seed **new undergraduate data science pathways** (e.g., courses, concentrations, or minors) at three or more task force academic institutions that are inclusive of women and minorities
- Establish a **menu of high-quality learning experiences** in data science to define the essential elements for successful real-world undergraduate experiences
- Develop and apply **assessment metrics** to the work
- Disseminate the **learnings** nationally through convenings, reports, webinars, and other platforms

# Example of Skills Mapping

## *Data Science Competencies for new BA at Miami Dade College*

Data management and integration	Write SQL statement	Create data set/cube	Create model	Profile data	Integrate data	Analyze data	Build rules	ID business logic	Validate data
Data modeling	ID business requirement	ID data resources	Define relationships btwn data	Manage meta data	ID missing data	Build a logical model	Create a data testing environ.	Run a query	Test model
Data security/governance	Build security model	Build secure access model	ID new compliance model	Comply with appropriate security/governance requirements					
Business operations	ID business org. structures	ID business issues	ID time element	ID business rhythms and cycles	ID value of data to business	Conduct financial modeling	Empathize with customer	Produce insight of data	
Visualization	Create report	Create a dashboard	Select appropriate visualization method for client and data	Prepare visualization for comparison to past performance	ID customer needs	Match report to business requirement			
Data mining	Choose appropriate statistical model for problem	Interpret results of data mining	Recommend action based on data mining	Partner with business mgmt. in taking action					
Data warehousing	ID data sources	ID dimensions of data	ID measures of data	Build data warehouse					

## For additional information:

- U.S. STEM education Model: <http://forio.com/simulate/bhef/u-s-stem-education-model/overview/>
- U.S. STEM Undergraduate Model: <https://forio.com/simulate/bhef/u-s-stem-undergraduate-model/overview/>
- National Higher Education and Workforce Initiative (HEWI)  
<http://www.bhef.com/our-work>
- HEWI Publications, including *Forging Strategic Partnerships for Undergraduate Innovation and Workforce Development* and *Strategy in Action: Building the Cybersecurity Workforce in Maryland*  
<http://www.bhef.com/publications/national-higher-education-and-workforce-initiative-forging-strategic-partnerships>  
<http://bhef.com/publications/strategy-action-building-cybersecurity-workforce-maryland>