GO VIRGINIA REGION 2

TALENT PATHWAYS INITIATIVE REPORT

2024

Life Science & Biotechnology Cluster

Transportation & Autonomous Manufacturing Cluster

Acknowledgments

The Virginia Tech Center for Economic and Community Engagement hosted the Region 2 Talent Pathways Initiative project. The following faculty and staff contributed to this project:

Adrian Davila, Ph. D., *Candidate Researcher*	Bryan Jones, *Economic Development Specialist*	Sarah Lyon-Hill, Ph.D., *Director of Research Development*
James Polhamus, *Graduate Researcher*	Ashley Posthumus, *Economic Development Specialist*	John Provo, Ph.D., *Executive Director*
Jemma Sabokrouh, *Program Manager*	Emmalee Wagner, *Project Coordinator*	Quina Weber-Shirk, *Program Manager*

The Region 2 Talent Pathways Initiative project team would like to sincerely thank the key implementation partners engaged in the project that advised the process, collaboratively hosted focus groups, shared economic and workforce development strategic plans, and engaged their networks of employers:

IMPLEMENTATION PARTNERS:

ACE 4.0 Coalition, *Nicole Akers and Jennifer Earley*

- Virginia Tech College of Engineering
- Virginia Western Community College, Central Virginia Community College, New River Community College, and Mountain Gateway Community College
- Genedge

Blue Ridge Partnership for Health Science Careers, *Cynthia Lawrence*

Central Virginia Workforce Development Board, *Traci Blido & Tim Saunders*

Greater Roanoke Workforce Development Board, *Morgan Romeo*

Lynchburg Regional Business Alliance, *Tori Gilmartin*

New River | Mount Rogers Workforce Development Board, *Marty Holliday*

Onward New River Valley, *Max Davenport & Katie Boswell*

Roanoke Blacksburg Innovation Alliance, *Jason Clayton, Taylor Spellman, Erin Burcham, & Jackie Lackey*

Roanoke Regional Partnership, *Julia Boas*

Photo Credit: Forged Film Co

Table of CONTENTS

LOCALITIES & SUPPORT ORGANIZATIONS

Botetourt County, *Kenneth McFadyen*

Campbell County, *Nina Rezai*

Lynchburg City, *Alisha Meador*

Pulaski County, *Jonathan Sweet*

Roanoke County, *Megan Baker & Karli Foster*

Roanoke City, *Bradley Boettcher & Alicia Cundiff*

Virginia Economic Development Partnership, *Shirley Dodson, Jessi Fritz, & Debbie Melvin*

Virginia Tech Corporate Research Center, *Laura Townsend*

The project team expresses its gratitude to the company representatives for generously sharing their time by attending focus groups, participating in interviews, and completing surveys.

Also, a very special thank you to the Riverlink Group and Elizabeth Povar, who conducted an external evaluation of the project and offered impactful guidance.

Lastly, thank you to 2ColorDesign and Amber Amburgey for designing the final report.

GO VIRGINIA REGION 2

Executive Summary

The state has provided each GO Virginia Region with funding to support a Talent Pathway Initiative. These Initiatives are intended to lead to a "deeper dive" into the needs of key industry sectors, highlight priorities for future funding by the regional council, and possibly serve as a catalyst to create sustainable industry cluster coalitions. Such coalitions, include industry, workforce, and education partners and are critical to addressing workforce needs, identifying skills, training, and high-impact strategies and projects for future implementation.

Six activities were planned for the one-year planning period:

1. **Development of industry coalitions directed by industry leaders and engaging workforce system partners**
2. **Completion of a quantitative and qualitative situational analysis of workforce needs for one or more high-impact industry cluster(s) prioritized by the region**
3. **Completion of a gap analysis related to the jobs needed to help such clusters grow**
4. **ID of the skills and training needed for people to fill such jobs, including a gap analysis of where such existing programs fall short in meeting identified needs**
5. **Development of an asset map that evaluates the region's capacity to support the identified unmet workforce needs**
6. **Identify strategies and supporting highest-impact pathway projects concepts for future implementation**

Industry	Projected Job Growth ('22-'28)	Average Hourly Wage*	Gross Regional Product
Life Science & Biotechnology	20%	$33.77	$2.80B
Transportation & Autonomous Manufacturing	37%	$31.83	$1.91B

*Regional Average Hourly Wage: $24.85

EXISTING INDUSTRY CONSORTIUMS AND REGIONAL DEVELOPMENT ORGANIZATIONS IN REGION 2 ARE BROADENING THEIR INITIATIVES TO STRENGTHEN SUPPORT ACROSS SECTORS.

The Blue Ridge Partnership for Health Science Careers is intensifying its focus on bioscience career pathways, working to unify and better integrate resources across subregions. Similarly, the more recently established Virginia's Additive Manufacturing & Advanced Materials Tech Hub, currently serving the New River Valley and Danville and growing in adjacent communities, is expanding its efforts in advancing emerging technologies and materials in manufacturing and prioritizing the development, retention, and attraction of skilled manufacturing talent. This group is relatively new, supported by a mix of federal and state funding, and is still working to build engagement around a joint workplan.

Stakeholders in Lynchburg are undertaking the Lynchburg Regional Workforce Roadmap, focused on defining career pathways and addressing workforce access, in part to serve the manufacturing needs of the subregion. Onward New River Valley and the Roanoke Regional Partnership have similar manufacturing leadership groups focused on promoting talent development, attraction, and retention programs in the region. Unifying these efforts across the region, and aligning with the AM2 Tech Hub where possible, will be an ongoing priority to strengthen impactful talent-based initiatives.

While renowned biology, engineering, and technical programs exist, Region 2 faces poor worker retention, too few mid-career professionals, and skilled worker shortages spurred by low regional program completions and an aging workforce.

KEY REGIONAL TALENT NEEDS FOR TARGET INDUSTRIES:

Entry-level 4-year graduates:

Cluster demand for workers with bachelor's degrees (24%) is 5 percentage points higher than the supply of eligible workers (19%) despite numerous graduates coming from regional higher education institutions. These graduates do not stay in the region, hindering access to highly skilled entry-level workers.

Mid-career professionals:

Declines in mid-career professionals (ages 45-59)--either through failures to retain, attract, or train—create gaps in supervisory and middle-management roles, creating barriers to regional economic growth.

Industry-ready, skilled workers:

Insufficient regional completion of technical training to fulfill workforce needs, featuring skills ranging from entry-level to highly specialized. Meanwhile, clusters are losing experienced workers as they retire.

STRATEGIC RECOMMENDATIONS + PROPOSALS

The following recommendations and programs will support talent retention, development, and attraction to in-demand occupations in Region 2, in addition to the full list provided at the end of this report. Given their collaborative expertise and alignment with sector-specific workforce needs, groups like the Blue Ridge Partnership for Health Science Careers and Virginia's Additive Manufacturing & Advanced Materials Tech Hub are well positioned to drive the successful implementation of the project concepts outlined in this report. Their roles as lead implementers or strategic partners are essential for maximizing the impact of these initiatives on the region's workforce development goals.

Develop a Larger Workforce Pipeline

STEM Talent Pipeline Programs:
Launch a region-wide initiative, such as GO TEC, to introduce middle and high school students to STEM careers, fostering a long-term pipeline of skilled workers for the target clusters.

Expand Educator Workforce Academy:
Provide educators with firsthand exposure to local industries to better integrate industry knowledge and career pathways into K-12 education, ensuring students are aware and prepared for high-demand jobs that may not require a four-year degree.

Second-Career Educator Program:
Develop a partnership between community colleges and employers to incentivize retired (or near-retirement-age) employees to be adjunct instructors, increasing the trainer pool and ensuring the transfer of skills and experience to younger generations.

Focus on hard-to-reach populations:
Develop short, rigorous adult learning programs with support for wrap-around services to bring hard-to-reach workers back into the workforce. These programs should work to accommodate worker needs such as childcare for parents, rehabilitative services for people with disabilities, or transportation and housing for those without access. Programs should provide stipends to support these adult learners who are gaining new skills and transitioning to new career paths, with guaranteed job placements through partnerships with participating companies.

Talent Development, Attraction and Retention

Internship and Young Professional Programs:
Support & expand existing programs like Leading Off Campus (Lynchburg), NRV Experience, and Onboard|ROA that focus on young professional development, networking, and community engagement to strengthen talent retention of 4-year graduates and those who could become mid-career professionals.

Management Programs:
Existing professional and managerial development courses offered by community colleges and 4-year institutions require stronger industry cluster engagement to better tailor and promote courses as well as identify and incentivize employees with the aptitude for mentoring and management.

Upskilling the Workforce:
Promote the available stackable credential programs for in-demand occupations for current employees or career-changers. Support the ongoing efforts of the workforce development boards to reintegrate discouraged workers into the workforce.

Introduction

In November 2023, the Virginia Tech Center for Economic and Community Engagement (VT CECE) began a 12-month initiative engaging with leaders in education and industry across Region 2 to focus on talent development for high-paying jobs in two specific industry clusters. This work was funded by the state Growth and Opportunity Virginia (GOVA) board, which allocated $2.5 million to each GOVA region for Talent Pathway Initiative (TPI) planning grants. TPI's purpose is to meet workforce needs through the connection of industry and education by "developing, retaining, and attracting talent to the Commonwealth to meet the needs of Virginia businesses.[1]" Prior to TPI, complementary talent-focused projects, such as the Lynchburg Regional Workforce Roadmap and the Greater Roanoke Regional Talent Strategy, were completed by implementation partners, helping lay the foundation for this initiative.

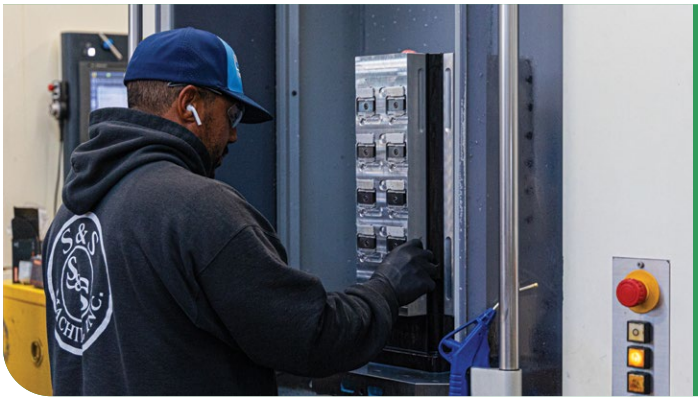
INDUSTRY CLUSTERS

The Region 2 TPI process focused on the region's two largest and fastest growing clusters:

Life Science & Biotechnology

The largest of the target clusters in terms of GRP; Includes research, development, and manufacturing of products and practices focused on disease prevention, health and aging, veterinary medicine, and plant sciences.

Photo Credit: Forged Film Co



Transportation & Autonomous Manufacturing

The 2nd largest cluster in terms of GRP; Includes freight truck, vehicle parts, and autonomous systems manufacturing, and a growing focus on automation and alternative vehicle fuels/energy applications.

From both a market perspective and an assessment of cluster capacity, these industry clusters are ripe for sustained transformational growth that the state envisions will follow the planning effort. Regional collaboration is essential for effective, long-term talent development and VT CECE engaged existing and emerging regional industry coalitions to develop ecosystems for high-growth potential: the Blue Ridge Partnership for Health Science Careers and Virginia's Additive Manufacturing & Advanced Materials Tech Hub.

[1] Governor Youngkin's budget plan advances GO Virginia initiatives on talent pathways and site development; restores base funding. GO Virginia.

Regional Workforce Trends

DEMOGRAPHIC TRENDS HIGHLIGHT THE NEED FOR TARGETED INTERVENTIONS.

Spread across the Lynchburg, New River Valley, and Roanoke-Alleghany Highlands metropolitan areas, Region 2 has a population of 783,579 that has seen stagnant growth since 2019, which contrasts with Virginia's growth rate of 3%.[2] This lack of growth is expected to continue through 2029. Meanwhile, unemployment is very low[3], meaning few people looking for work cannot find a job, and those not in the labor force either do not want to or struggle to enter the labor force. These trends imply the region may struggle to meet future labor demands of growing industries without targeted interventions.

Specific talent retention and attraction activities may need to focus on the following demographics:

Young adults at 4-year institutions:

The region benefits from a significant population of young adults, particularly those aged 20-24, who have increased by 3% in recent years. This is largely due to the presence of 15 higher education institutions in the region, offering a potential talent pool if properly leveraged. Currently, most of these adults leave the region after receiving their education.

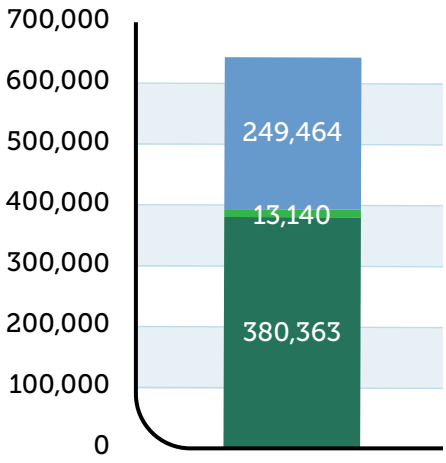
Mid-career adults:

While adults in their 30s have experienced a 5-6% growth, mid- to late-career adults (aged 45-59) have declined sharply, with a decrease ranging from -5% to -12%. This demographic shift signals a potential gap in middle management and supervisory roles.

Late-career adults:

The region's rising retirement rates in high-demand occupations suggest that significant industry knowledge is exiting the workforce, further straining the talent pipeline.

Region 2 Labor Force Participation, 2024



[2] Lightcast, Population Demographics Report, 2024
[3] Lightcast, Economy Overview Report, 2024

Region 2 is not retaining its 4-year graduates, resulting in a demand and supply mismatch of jobs requiring bachelor's degrees.

With over 10 higher education institutions, including major institutions like Virginia Tech and Liberty University, the region attracts a diverse and talented student population. However, many graduates leave the area post-graduation, creating a retention issue. While 32% of the population holds a bachelor's degree or higher, a significant portion consists of students who do not remain in the region long time. This contributes to a skills gap, as jobs requiring a bachelor's degree account for 24% of the regional job market, but only 19% of the population over 25 years old holds this qualification.[4] The resulting 5% gap highlights a shortage of skilled workers and the potential for talent drain.

This issue has prompted several collaborative efforts to address workforce retention. Regional economic development organization (REDO) internship initiatives such as the NRV Experience and Get2KnowNoke, funded by GOVA, have shown positive outcomes. However, the region could achieve a more focused and sustainable impact through industry-led consortia.

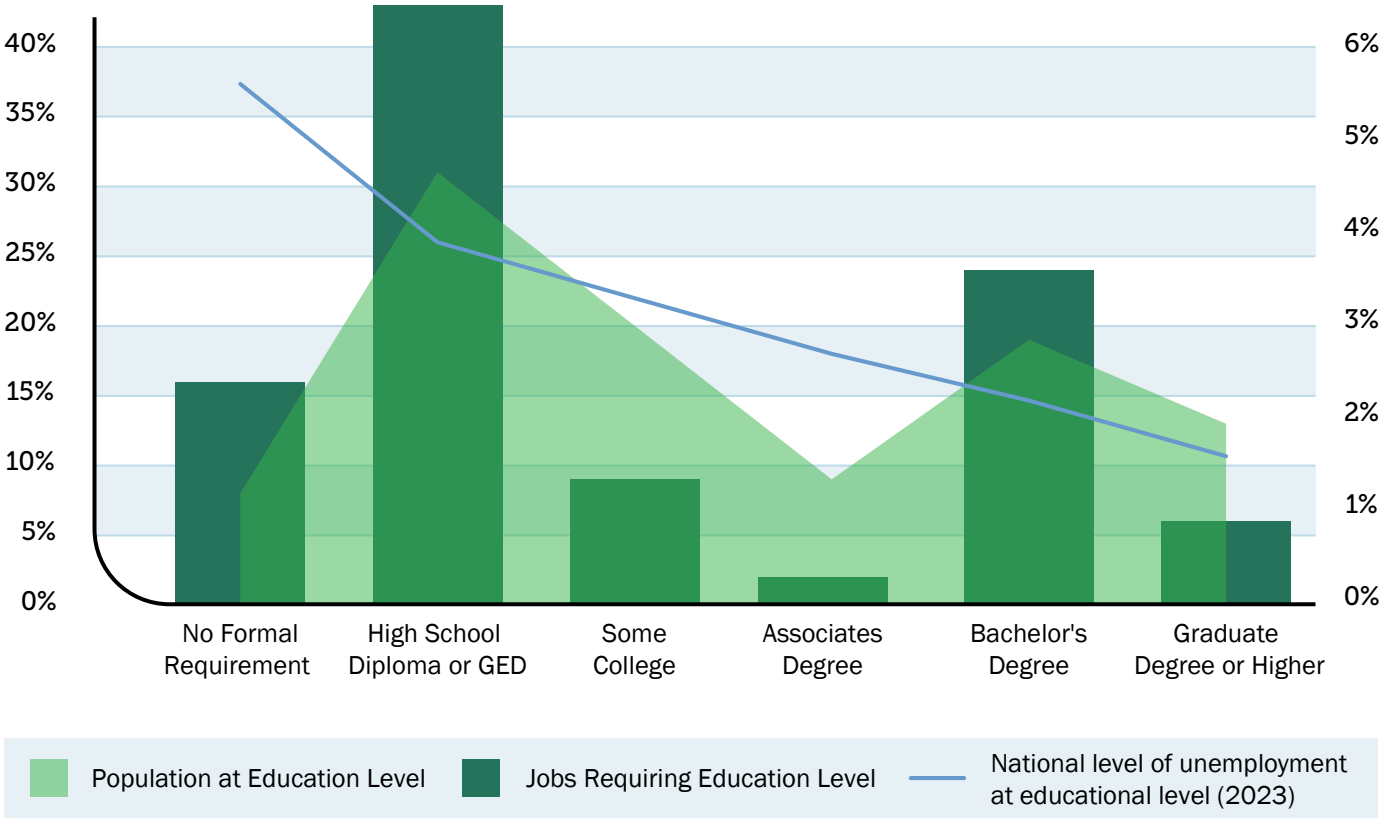
It is important to note that higher education in the region, particularly at Virginia Tech and Liberty, functions as an export business, with many graduates relocating elsewhere after completing their degrees. This dynamic distorts the data and calls for a reassessment of expectations when evaluating workforce retention and aligning qualifications with job demands.

Much of Region 2's population is underemployed due to vertical mismatch between required entry-level education and educational attainment of the population.

More than 50% of the available jobs in the region only require a high school diploma or equivalent, yet only 10% of the population lacks this level of education. This suggests that many residents are working in jobs for which they are overqualified, leading to underemployment. Aligning job opportunities with workforce qualifications—especially at the high school education level—is essential to minimizing this mismatch. Additionally, providing students with clearer guidance on job market demands can help ensure their educational pursuits better match regional needs, reducing underemployment.

[4] Lightcast, Educational Attainment, 2024

Underemployment in Region 2, 2024[5]



Regional education and workforce programs are not producing enough technically skilled graduates or mid-level managerial workers necessary for both Life Sciences & Biotechnology and Transportation & Autonomous Manufacturing industry clusters.

In both target industries, there are critical workforce shortages in specific occupations. Positions such as Industrial Machinery Mechanics, Equipment Operators, Electricians, and Machinists are in high demand, requiring technical skills and credentials, though not necessarily a four-year degree. Unfortunately, the region's current educational programs are not producing enough graduates to meet this demand, resulting in a gap between employer needs and available workers.

Similarly, positions like First-line Supervisors and General/Operations Managers face significant turnover rates and experience many annual openings. These roles require experience and leadership, but the consistent need for replacements suggests a disconnect between worker retention and the demands of these positions. Filling these in-demand roles and reducing turnover will require efforts to boost both technical training and leadership development in the region's workforce programs.

[5] Lightcast, Regional Workforce Underemployment Report, 2024

Life Science & Biotechnology Cluster

The Life Sciences & Biotechnology (LSB) cluster's foundation is in the research, development, and manufacturing of products and practices focused on disease prevention, health and aging, veterinary medicine, and plant sciences.

Leaders in this cluster have secured support from GOVA, the U.S. Economic Development Administration, and state funds, facilitating technology company development, lab space construction, and workforce pipeline initiatives for sustainable growth.

At a Glance:[6]

Total GRP	$2.80B
Sub-Cluster GRP:	
R&D	$184M
Manufacturing	$365M
Living Laboratory/Healthcare System	$2.25B
Total Private Employment	27K+
Average Hourly Earnings:	$31.83
Location Quotient (2022)	1.15

Notable companies include, but are not limited to:

Abbot Laboratories (Alta Vista, VA)
Carilion Clinic Innovations (Roanoke, VA)
CytoRecovery (Blacksburg, VA)
Fleet Laboratories (Lynchburg, VA)
Novonesis (Salem, VA)
Skyphos (Blacksburg, VA)
TECHLAB, Inc. (Blacksburg, VA)
Teva Pharmaceuticals (Forest, VA)
Tiny Cargo (Roanoke, VA)

[6] Lightcast, Industry Report, 2023

Photo Credit: Forged Film Co

INDUSTRY CONSORTIUM

The Blue Ridge Partnership for Health Science Careers (BRPHSC) was established in 2019 in part through GOVA planning grant funds. This employer-led coalition in Region 2 focuses on aligning education and workforce needs in health and life sciences. With Carilion Clinic as the anchor, the coalition integrates efforts of 48+ stakeholders to enhance health sciences education and meet workforce demands in the region. Significant research into in-demand occupations, skills, and competencies has been conducted in support of the Health Science Careers pathway and asset mapping. Towards the end of 2024, the partnership established the Biotech/Bioscience Workgroup to address the occupational needs of the Life Science and Biotechnology Cluster, beginning its initiative in partnership with VWCC and industry leaders.

While there are some overlaps in focus and career pathways, Health Science and Life Science/Biotechnology differ in composition and focus, which has implications for the region's growth and development strategy. In contrast to previously mentioned areas of focus for Life Science/Biotechnology clusters, the Health Science cluster primarily includes roles directly tied to healthcare services and patient care, such as clinical and medical support positions.

Recent policy changes in state GOVA guidelines regarding healthcare sector support highlight the need to closely examine and adapt the future composition of these clusters. As state support shifts, it may become necessary to realign regional priorities, potentially expanding the Life Science/Biotechnology cluster while reevaluating support for traditional Health Science roles. This realignment should be addressed in the upcoming 2025 GOVA Region 2 Growth and Development plans to ensure that the region's workforce and economic development strategies reflect evolving state policies, sector needs, and workforce opportunities.

SECTOR-SPECIFIC TRENDS & THEIR IMPACT ON WORKFORCE NEEDS

The life sciences and biotechnology sectors are diverse, with distinct trends shaping workforce needs. As these fields evolve, they are driving demand for specialized skills and knowledge, which has direct implications for employment in SOC-19 occupations.

Genomics:

The field of genomics is experiencing rapid growth due to advancements in DNA sequencing technologies, personalized medicine, and bioinformatics. There is a rising demand for professionals skilled in genetic analysis, data interpretation, and the application of genomic data to clinical practice.

Pharmaceuticals:

The pharmaceutical sector, particularly in areas like drug development and clinical trials, is another key driver of workforce demand. These roles require advanced knowledge in chemistry, pharmacology, and regulatory science, as well as skills in process development and quality control. Of particular interest to companies in Region 2 may be the technology and systems of pharmaceutical and therapeutic delivery.

Precision Medicine and Diagnostics:

Precision medicine is an emerging area that combines genomics, molecular biology, and IT/data analytics to tailor treatments to individual patients. As precision medicine becomes more widespread, there will be an increasing need for professionals who can interpret complex genetic data, analyze the body's systems more holistically, and collaborate with healthcare providers to develop personalized treatment plans.

EMPLOYER NEEDS

Interviews with eleven professionals from eight companies and a survey of five other companies revealed a diverse range of workforce needs largely dependent on a business' maturity stage. The region has both a plethora of smaller companies with less than 10 employees, often even less, and a few larger companies with hundreds of employees.[7]

In Region 2, in-demand Life Science occupations are paid $1-$4.50 less hourly (in adjusted COL wages) than in Raleigh, NC, which may contribute to challenges in attracting or retaining talent, in particular for engineering and chemist occupations.

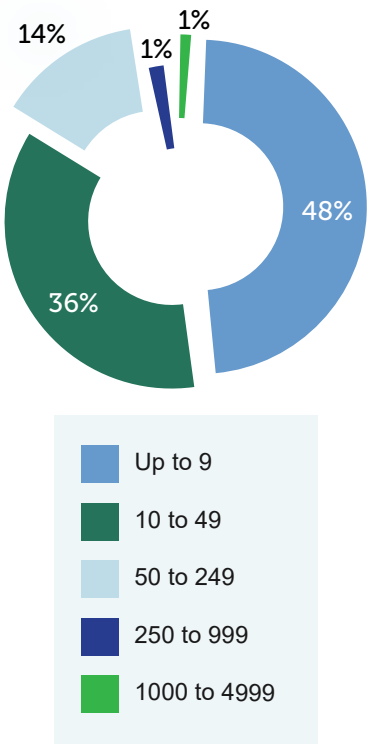
Although the cost of living for Biological and Medical Scientists in Region 2 is competitive with comparable metro areas like Raleigh, NC, employers note that workers in Region 2 may still leave due to limited early-career professional development opportunities. This challenge is largely due to a shortage of mid-sized Life Science companies in Region 2, creating a bottleneck for career advancement.

For smaller companies, Region 2 requires more skilled consulting talent in capital growth and management as well as regulatory and testing services. This consulting talent would potentially support all life science start-ups rather than being employed by one, cash-strapped start-up business.

Smaller companies face unique challenges. Despite a supportive ecosystem, Region 2 lacks crucial resources for scaling businesses. Non-dilutive funding remains critical for startups to secure capital without losing ownership, and the absence of such investment infrastructure limits opportunities for startups and emerging businesses to secure early-stage funding, which is critical for innovation and growth. Regulatory support is also a significant need for life science and biotechnology startups, as navigating Federal Drug Administration and international regulations is crucial for market entry. Companies require regulatory affairs services for compliance guidance, testing, and quality control to avoid delays. These services are not readily available in this region and are often outsourced out of the state or country.

Small business owners must manage multiple roles like R&D, marketing, and grant writing, typically with limited support from 1-2 partners. Although the region has a strong, educated talent pool, advancements in technologies and research methods require candidates with higher levels of education and practical experience. As a result, companies must offer competitive compensation, which can be difficult for smaller employers to afford. Ideal candidates are described as having a "Swiss Army Knife" skill set, blending scientific expertise with non-STEM skills like communication or business management skills. Smaller companies could focus on upskilling employees, but face training difficulties due to limited resources and time.

Life Science Business Size by Employees



> **"When you're talking about startups, especially, you really need individuals who are very multi skilled; finding people with a diverse set of skills would be ideal."**
>
> ***-Industry Leader***

[7] Lightcast, Business Size Distribution by Sector, 2024

Photo Credit: Forged Film Co

Larger Region 2 businesses need a sufficient pipeline of workers to replace retiring biological and chemical technicians as well as general maintenance and operator positions with experience in the life sciences and biotechnology.

Larger businesses face significant challenges with recruitment and retention. In addition to employing life science professionals, these companies require maintenance and operator roles to manage large industrial equipment. Local competition, higher skill requirements, and the rural nature of the region drive up the cost of hiring qualified workers across the range of necessary occupations.

Industry professionals have identified biological technicians as a key occupation in the region. Supporting data shows 476 positions in 2023, with significant growth over the past five years. While the projected growth rate is a moderate 5%, roles such as biological scientists, technicians, and laboratory technicians—particularly those with expertise in microbiology or biology—are consistently highlighted by employers as being in highest demand.

One of the most pressing challenges for SOC-19 occupations is the anticipated turnover due to an aging workforce. This trend highlights the need for strategic succession planning and a focus on recruiting and training younger professionals to fill these upcoming vacancies. In occupations like Chemical Technicians, where nearly half the workforce is aged 45-64, the industry must prepare for a wave of retirements in the next 5-10 years.

> **"We live in an area that is rapidly developing in terms of its intellect and appetite for biotechnology...We've got a giant hospital that has captured the audience in Southwest Virginia... And then we have one of the best engineering schools on the planet. It makes sense that we would want to develop and cultivate our own [talent]."**
>
> ***-Industry Leader***

EDUCATIONAL ASSET MAPPING

Career and Technical Education (CTE) programs spur interest and knowledge of general medical and scientific occupations but could offer more modules focusing on the integration of biotechnology, analytics, and IT within the life sciences.

To categorize the extensive list of CTE programs and classes in Region 2, every available CTE website and source was reviewed, resulting in a comprehensive spreadsheet. These categories include:

Health & Medical Science

Agriculture & Horticulture Science

Animal Science

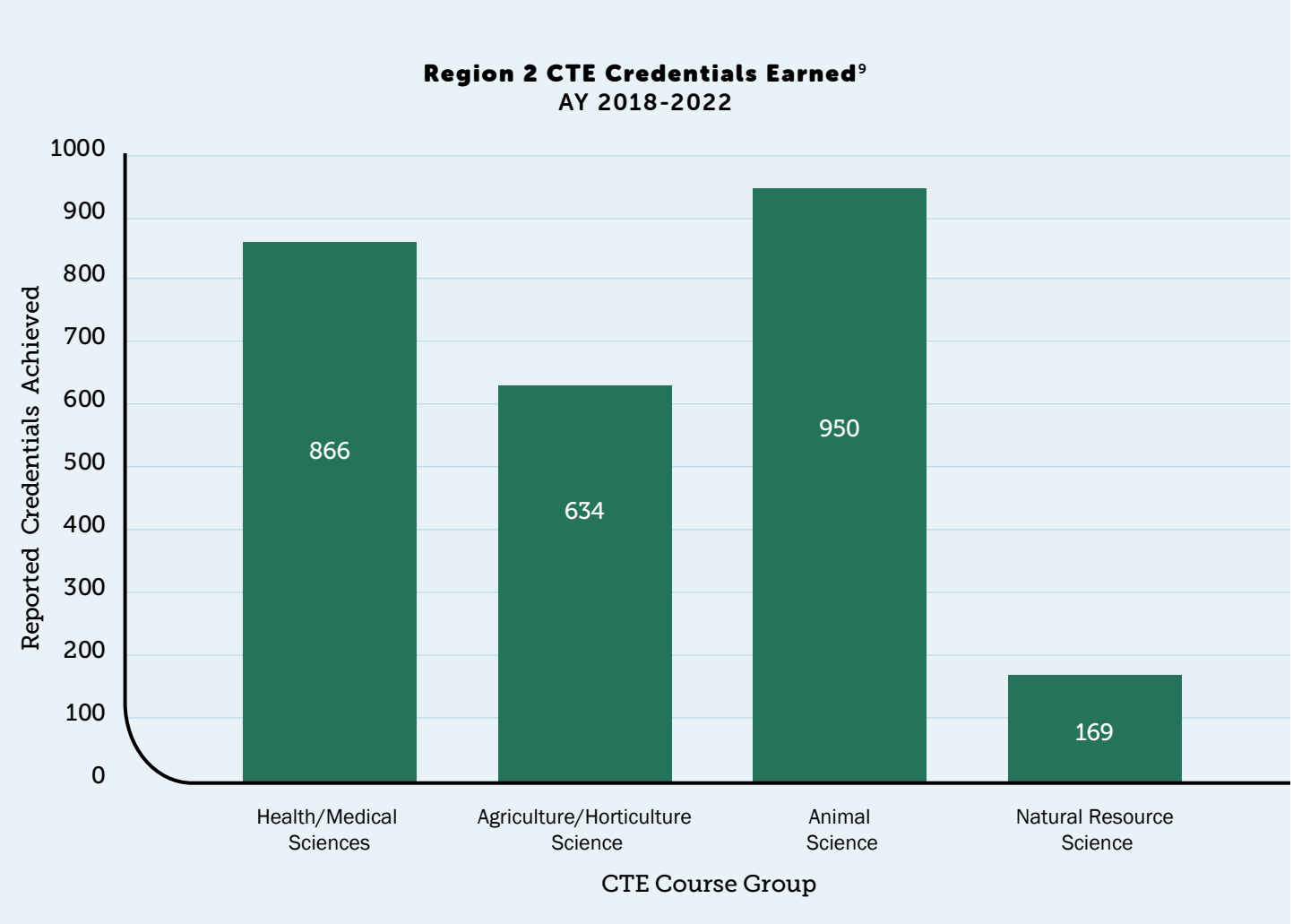
Natural Resource Science

including Forestry and Environmental Conservation

CTE Courses Aligned with In-Demand Occupations Available in Region 2

CTE Course Group[8]	Courses offered (as of AY 23)	High Schools in Region
Health and Medical Science	7	25
Agriculture and Horticulture Science	6	15
Animal Science	3	13
Natural Resource Science	2	4

[8] Available CTE programs were grouped according to CTE course codes. While helpful for organizing the courses, the course codes do not capture the breadth of available learning opportunities. There may be only 4 distinct Natural Resource Science course codes represented, but this can correspond to dozens of classes. Each course typically has introductory and advanced versions (I & II) with varying lengths (18 or 36 weeks).



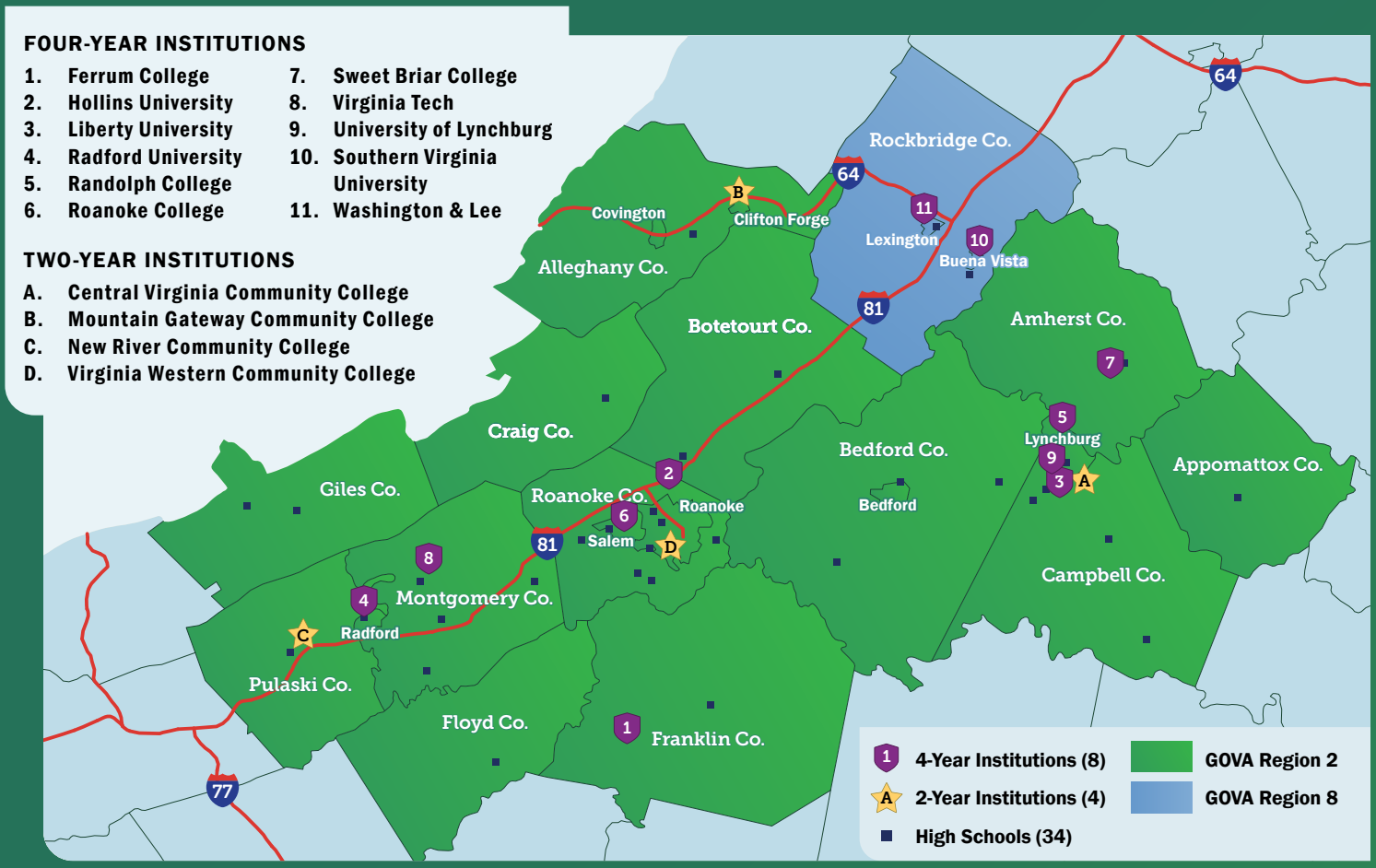
Programs like “Intro to Health and Medical Sciences (36 weeks)”, “Medical Terminology (36 weeks)”, and “Nurse Aide I & II”, have substantial enrollment and completion rates, highlighting strong interest in foundational health and medical sciences education. Similarly, high completion rates among introduction courses in Life Science programs such as Horticulture Sciences, Foundations of Agriculture, Food, Natural Resources, Small Animal Care I, and Veterinary Science show a strong desire for education in this field.

The four Governor’s Schools in the region offer specialized courses such as Computational Biology, Biotechnology Concepts, Organic Chemistry Lab, and Human Anatomy, providing students with targeted education aligned with Life Science and Biotechnology careers. However, current CTE offerings in the region lack biology-focused courses. Introducing CTE courses like Medical Laboratory Technology, Biotechnology Applications in Agriculture, Biomedical Technician, or Principles of the Biomedical Sciences could bridge this gap. For instance, students completing the Medical Laboratory Technology course can earn Phlebotomy Technician credentials, and those taking Biotechnology Applications in Agriculture can obtain various pesticide certifications.

It is important to note that the Virginia Department of Education (VDOE) does not offer an industry credential for the Biomedical Technician or Principles of the Biomedical Sciences courses. Instead, students have access to Occupational Assessments, which evaluate their comprehension of the course material. Additionally, these courses often include capstone projects to further demonstrate their knowledge and skills.

[9] Virginia Department of Education, Credential Build-A-Table

Life Sciences & Biotechnology Educational Programs Asset Map



Post-secondary program completions in Life Sciences and Biotechnology show a clear degree-level contrast: regional completions for in-demand roles needing a 2-year degree or less fall short of annual job openings, while 4-year or higher completions exceed demand, with many graduates likely leaving the region.

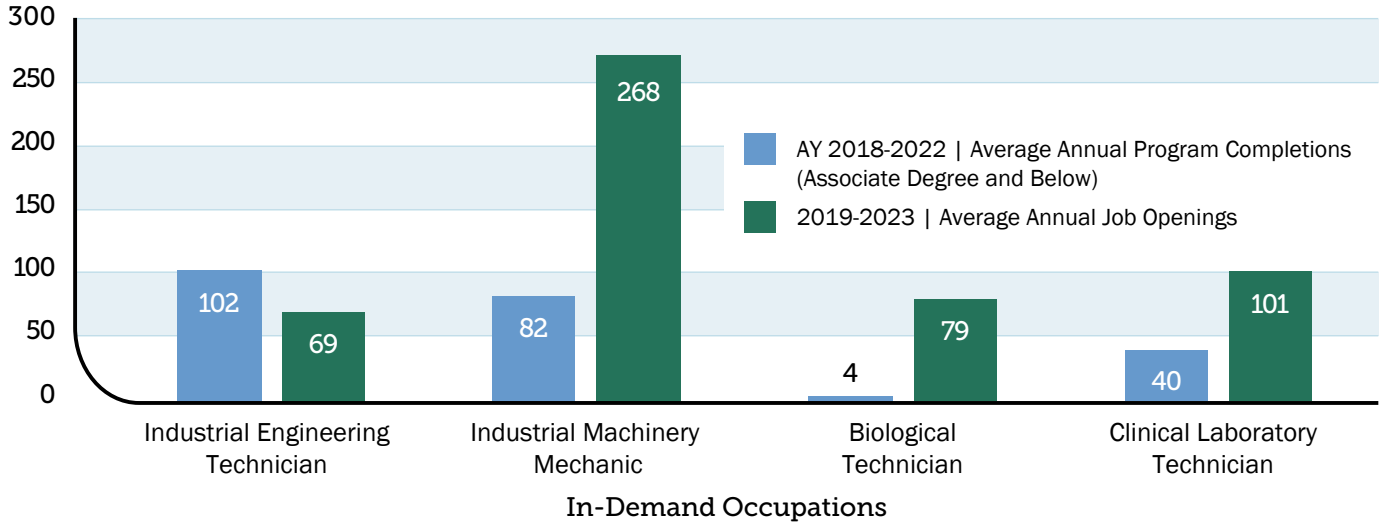
There are four 2-year institutions located in Region 2: Central Virginia Community College (CVCC), Mountain Gateway Community College (MGCC), New River Community College (NRCC), Virginia Western Community College (VWCC).

The required educational attainment for entry-level positions in high-demand occupations varies, ranging from a high school diploma to a graduate degree. This variation was evident in the employer survey, where respondents were asked, “What is the minimum education level accepted for entry-level, skilled life science positions at your company?” Responses spanned from career studies certificates to graduate degrees.

Despite this, programs specifically tailored to high-demand occupations remain limited. VWCC offers two Associate degrees and two Career Studies Certificates, both in Biotechnology and Medical Laboratory Technology, while Radford University offers a Career Certificate in Medical Lab Science. In 2022, VWCC introduced an Associate of Science degree with a Biotechnology emphasis to meet the regional demand for biological technicians. This program serves either as a foundation for pursuing a 4-year degree or as a pathway to the workforce, providing students with practical, hands-on experience.

Clinical Laboratory Technician positions typically require a minimum of a 2-year degree, but the region’s annual completion rates over the past four years have consistently fallen short of meeting the average annual job openings. Even when factoring in Radford University’s 4-year degrees in Clinical Laboratory Science and Medical Technology, the regional supply remains insufficient to meet the demand.

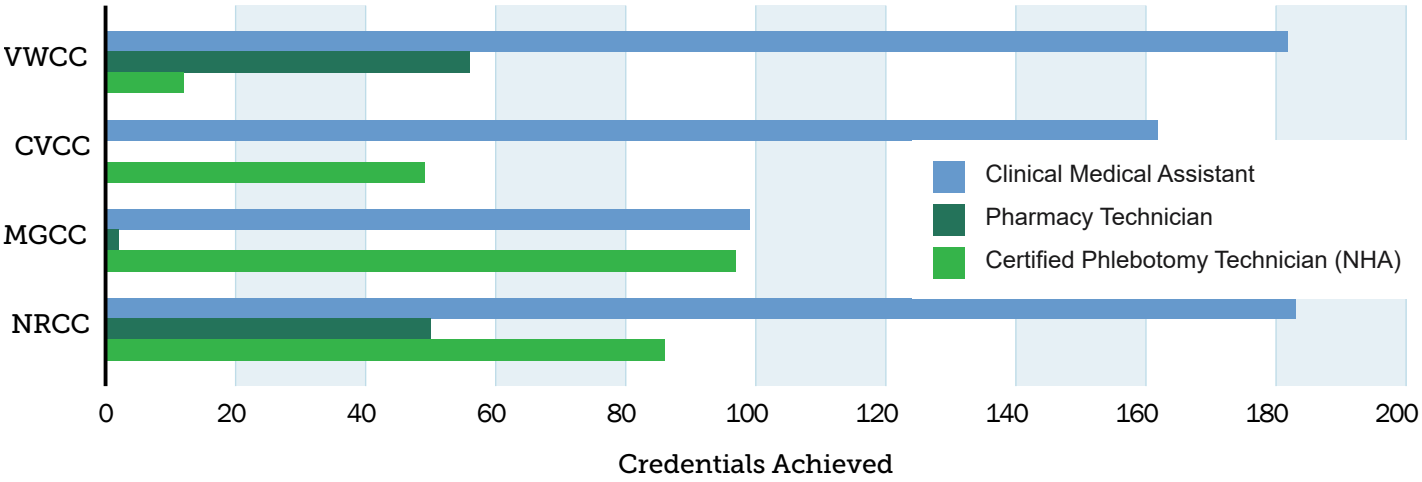
Region 2 - Average Annual Program Completions and Job Openings[10, 11]



FastForward Grant Program

The FastForward program, offered through the Virginia Community College System (VCCS), is a workforce training initiative designed to address the state's demand for skilled workers through short-term training courses for high-demand professions. The program provides tuition assistance by sharing training and certification costs among the students, the community college, and the Commonwealth of Virginia. This collaboration aims to produce industry-certified professionals ready to meet employers' needs. Notably, over 95% of FastForward participants complete their training, and approximately 80% report satisfaction with job stability post-credential.

FastForward Credentials Achieved for Life Science Occupations
FY 2018-2023



Between FY 2018 and 2023, the programs with the highest credential completions were Clinical Medical Assistant, with over 600 completions, and Certified Phlebotomy Technician, with over 200 completions. These credentials prepare individuals for in-demand roles such as Clinical/Medical Laboratory Technician, Biological Researcher, and Medical Scientist. Additionally, just over 100 FastForward credentials were awarded for Pharmacy Technician, which can also lead to these high-demand occupations. Although these programs effectively produce skilled talent in this region, there are limited program offerings for life science-specific programs, similar to the limited options available at the CTE and 2-year-and-below levels.

[10] Virginia Office of Education Economics, Virginia Post-Secondary Completion Dashboard
[11] Lightcast, Annual Job Openings Report, 2024

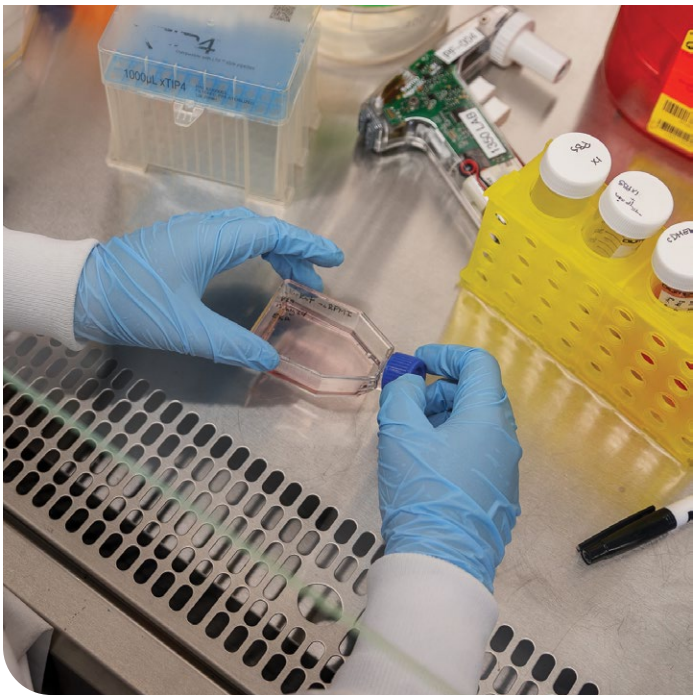


Photo Credit: Forged Film Co

Region 2 hosts a plethora of 4-year institutions offering an abundance of talent for the life science and biotechnology clusters; however, most of this talent leaves the region despite clear demand for bachelor's and graduate degree workers.

Region 2 is home to a diverse range of higher education institutions, including public, private, and for-profit schools. These include Ferrum College, Hollins University, Liberty University, Lynchburg College, Radford University, Randolph College, Roanoke College, Roanoke Higher Education Center, Virginia College of Osteopathic Medicine, Virginia Tech (including the VT Carilion School of Medicine), all of which offer educational programs that support the life science and biotechnology industries.

Other career-focused institutions include American National University and East Coast Polytechnic Institute, which offer fast-tracked, industry-specific credential programs and degrees that align with in-demand occupations in the life sciences and biotechnology industry. (Degree award information is not public, and therefore not included in the report.)

Additionally, Southern Virginia University and Washington and Lee University are located on the region's periphery and may be a source of talent for life science and biotechnology companies in Region 2.

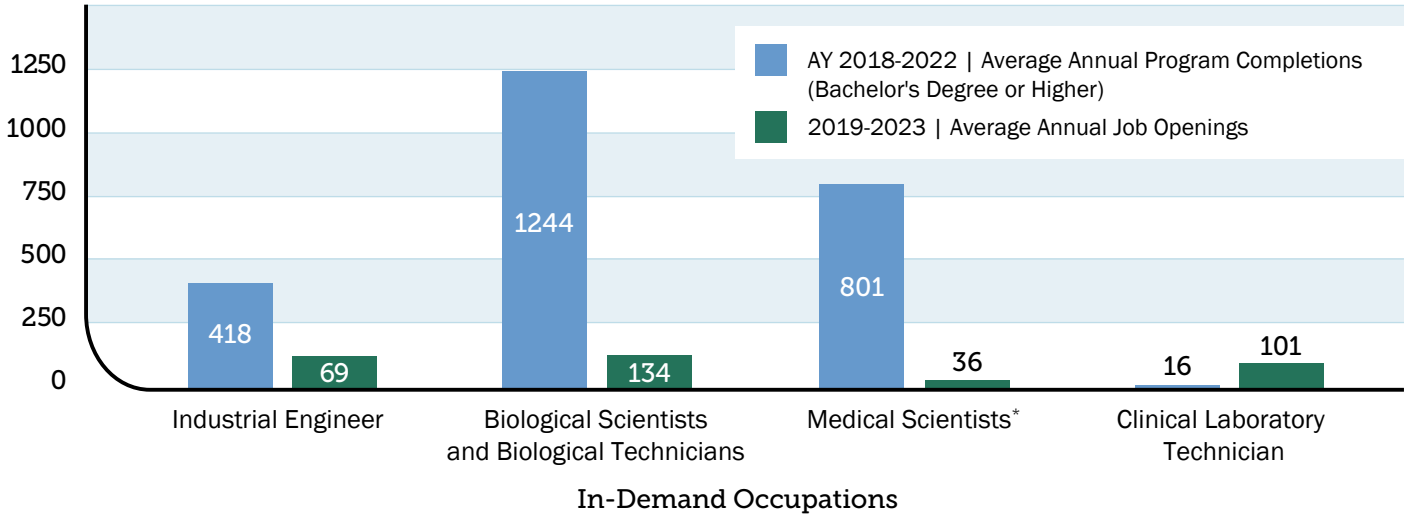
This region generates an abundance of 4-year degrees that align with the industry's in-demand occupations of Biological Technicians and Biological Scientists. Liberty University and Virginia Tech offer most of the specific Bachelor's and Master's programs related to Life Science and Biotechnology in the region.

The higher education institutions in Region 2, with advanced degree programs in health and life sciences, produce a significant pool of highly skilled talent. Institutions such as Virginia Tech, VT Carilion School of Medicine, Liberty University, and the Virginia College of Osteopathic Medicine offer specialized programs that prepare graduates for advanced research roles and align with the qualifications needed for occupations like medical scientists. While this output represents a substantial talent pipeline, there is still a gap in fully meeting the workforce demands of the life sciences and biotechnology sectors, highlighting the need for continued alignment between educational programs and talent retention efforts.

The other regional universities provide more generalized programs of study, such as Engineering and Biology, highlighting the strong pool of talent being developed in the area. This presents an opportunity for local companies to retain this talent by offering work-based learning opportunities to students while they complete their education, fostering a pipeline of skilled professionals within the region.

Washington & Lee University and Southern Virginia University awarded an average of 79 degrees between AY 2018 - 2022 for programs that lead to Biological Scientist or Technician positions.

Region 2 - Average Annual Program Completions and Industry Demand [12,13,14]

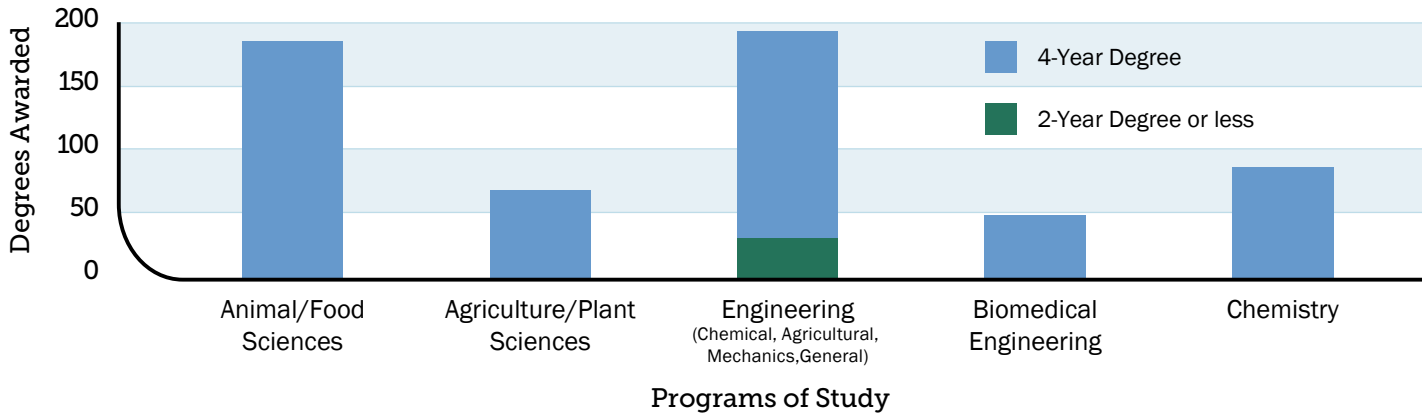


*Biological & Clinical Laboratory Technician Programs are applicable programs too)

Besides the direct program pipelines to in-demand occupations, there are a number of programs available in the region that align with evolving workforce needs.

The Life Science and Biotechnology industry is grounded in cutting-edge research and development, with a broad scope in the study of life sciences. This sector requires a diverse range of academic backgrounds for its various occupations. In addition to the programs available for the previously reviewed in-demand roles, there is a growing need for skilled professionals with education in animal and plant sciences in this region. Technicians, engineers, and chemists are particularly sought after to develop and test biomedical devices or to provide services for large industrial plants.

Region 2 - Average Annual Completion of Related Life Science Studies [15]
AY 2020-2022



There is significant annual regional completion of Animal/Food science programs and engineering programs that support the Life Science industry. In AY 2021, the first cohort of students completed the Bachelor-level Bioengineering and Biomedical Engineering programs at Virginia Tech.

[12] Higher education in the region, especially at Virginia Tech and Liberty, functions as an export business, with many graduates leaving after graduation, highlighting the need to reassess workforce retention expectations and job alignment.
[13] Virginia Office of Education Economics, Virginia Post-Secondary Completion Dashboard
[14] Lightcast, Annual Job Openings Report, 2024 [15] Virginia Office of Education Economics, Virginia Post-Secondary Completion Dashboard
[15] Virginia Office of Education Economics, Virginia Post-Secondary Completion Dashboard

Transportation & Autonomous Manufacturing Cluster

The Transportation & Autonomous Manufacturing (TAM) cluster includes heavy-duty truck manufacturing, motor vehicle parts manufacturing, and automation (both land and air). This cluster has long been a focus for workforce development and research efforts.

At a Glance:[16]

Total GRP	$1.91B
Sub-Cluster GRP:	
Automation	$214M
Vehicle Parts Manufacturing	$584M
Vehicle Manufacturing	$1.1B
Total Employment	12.5K+
Average Hourly Earnings:	$34.32
Location Quotient (2022)	2.63

Notable companies include, but are not limited to:

Aeroprobe (Christiansburg, VA)
Cowden Technologies (Blacksburg,VA)
Ess Technologies (Blacksburg, VA)
Hanwa Azdel (Lynchburg, VA)
Mack Trucks (Salem, VA)
Metalsa (Cloverdale, VA)
RDL Mods (Dublin, VA)
S & S Machine, Inc. (Madison Heights, VA)
Schrader-Pacific Advanced Valves (Alta Vista, VA)
TORC Robotics (Blacksburg,VA)
Volvo (Dublin, VA)

[16] Lightcast, Industry Report, 2023

INDUSTRY CONSORTIUM

Educational and training partners, along with researchers and industry leaders, came together to build Virginia's Additive Manufacturing & Advanced Materials (AM2) Tech Hub, a coalition that has secured state general fund support and is developing a 10-year roadmap that prioritizes industry needs from startups to scale-ups, identifies implementation projects that enhance the expertise and responsiveness of ecosystem resources, and fosters a collaborative consortium of players in the New River Valley and Danville region (and growing in adjacent communities). Recently, AM2 Tech Hub began the process of organizing the introduction of the Great Opportunities in Technology (GOTEC) program in Region 2 through the coalition members.

Industry 4.0 for the Automated-Connected-Electrified (ACE) Workforce is a cluster scale-up project funded through GOVA Region 2 with an overarching mission to establish Region 2 as global leaders in next-generation transportation manufacturing and automation. This is achieved by providing direct technical assistance and advising to sector companies and enhancing and implementing the Industry 4.0 Curriculum that was developed through a prior Virginia Tech-led GOVA ECB grant. A U.S. Economic Development Administration Phase 1 award helped establish the ACE Coalition, which is composed of over 150+ public, private, and non-profit organizations.

SECTOR-SPECIFIC TRENDS & THEIR IMPACT ON WORKFORCE NEEDS

All transportation manufacturing and autonomy sectors are evolving rapidly due to advancements in technology, shifts in consumer demand, and a stronger focus on sustainability. Key subsectors reshaping the workforce landscape include:

Automation and Robotics:

As companies adopt automation and robotics technologies to enhance productivity and efficiency, there is a growing demand for professionals skilled in these areas. This shift emphasizes the need for specialized training in automation and robotics, as well as continuous professional development to stay current with technological advancements.

Electric and Autonomous Vehicles (EV/AV):

As traditional automotive manufacturing declines, there is also a need for reskilling workers from conventional roles to adapt to new technologies and systems in the EV/AV space. This growing emphasis on EVs and AVs also creates a demand for specialized electrical engineers and vehicle systems engineers.

Advanced Manufacturing Techniques:

Additive manufacturing integration is leading to a desire for workers proficient in additive manufacturing techniques, materials science, and digital design. This trend highlights the need for ongoing education and training in emerging manufacturing techniques and the importance of staying abreast of technological advancements.

EMPLOYER NEEDS

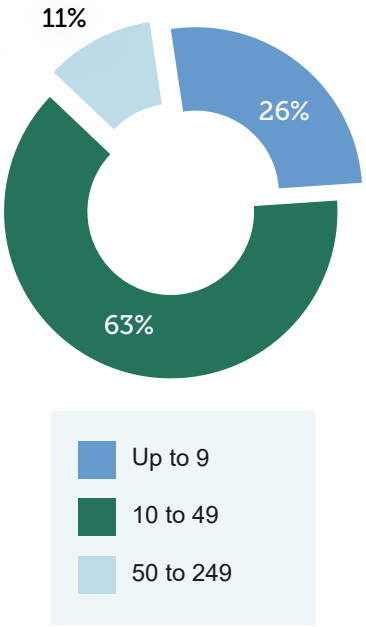
The project team conducted interviews with 12 companies to gain insights into the employment landscape within the transportation manufacturing and autonomy cluster. These interviews, supplemented by additional surveys, offer valuable context for developing actionable steps to address the barriers identified by these companies. The companies varied in size, ranging from start-ups with fewer than 50 employees to enterprises, with the majority of participating companies employing between 100 and 200 individuals. Their operations encompassed a broad spectrum within the cluster, including automotive manufacturing and repair, autonomous transportation, and automation.

Source for Business Size Distribution Chart[17]

In Region 2, engineering and managing roles are paid $5-$11 less hourly (in adjusted COL wages) than in Raleigh, NC[18], which may contribute to challenges in attracting or retaining medium to senior-level employees.

The most in-demand occupations fall into three groups: 1) machinists and assemblers; 2) engineers; 3) installation, maintenance, and repair technicians. Conversations with company representatives revealed that every organization had some form of on-the-job training program, resulting in a low educational barrier to entry for occupations in this industry. Nearly all companies required only a high school diploma or equivalent for entry-level roles. For some local businesses, recruiting entry-level candidates was not a concern due to the abundance of qualified applicants and a low skill threshold. However, they faced challenges in filling mid- to senior-level and highly technical positions. This gap in experienced and technical talent is largely attributed to limited financial resources; companies struggle to offer competitive salaries for experienced candidates and often cannot afford to substantially upskill entry-level employees. Consequently, there is a mismatch between the labor force and the qualifications desired by employers.

Transportation & Autonomous Systems Manufacturing Business Size by Employees[17]



> **"The local talent needs significant training when we're looking to hire them to be machinists or assemblers, and then after we train them, they often get recruited away by employers outside of the area who can offer larger salaries which makes it difficult to continue justifying investment in training talent without the necessary skillsets."**
>
> ***- Local Employer***

[17] Lightcast Business Size Distribution by Sector, 2024

[18] Lightcast Datarun, 2023

The region offers training programs to develop skilled talent, but the supply remains limited, creating competition for workers. Employers note that entry-level talent often lacks specific industry skills and do not easily apply the knowledge they learn in classrooms to the factory floor. They lack the hands-on experience, workforce-ready skills, and/or appropriate expectations needed to transition easily to the manufacturing workforce.

Looking to the future, companies do not anticipate the most in-demand occupations will change. However, it was almost unanimously agreed that advanced technological development would change the skills and basic competencies needed for the most in-demand occupations. As noted in the 2023 GOVA Region 2 Growth & Diversification Plan, training for electrification and automation technologies, employers stated this should be a priority for talent development in the region. There was consensus that increased technological competency would be a necessity for those who wish to work in the industry, becoming relevant as early as entry-level positions. Most of the companies interviewed indicated they would be willing to support some type of pipeline programming to ease the transition from school to the workplace and increase the number of highly qualified applicants.

> **"Our industry is moving towards incorporating increasing amounts of automation and machine learning into our manufacturing processes and leveraging related skillsets to help drive performance improvement activities within our operations."**
>
> ***-Local Employer***

EDUCATIONAL ASSET MAPPING

CTE programs introduce students to in-demand occupations and skill sets in engineering, manufacturing, and systems technologies. Participation and completion of these courses indicate significant regional interest and continuing to support and encourage access to these programs should be prioritized.

To categorize the extensive list of CTE programs and classes in Region 2, every available CTE website and source was reviewed, resulting in a comprehensive spreadsheet. These categories include:

Automotive Technology

Includes Drone Courses

Engineering

Design and Technology

Manufacturing and Machine Systems Technology

Includes Electrical Technology, Mechatronics and Robotics courses

Welding

CTE Courses Aligned with In-Demand Occupations Available in Region 2 (AY 2023)

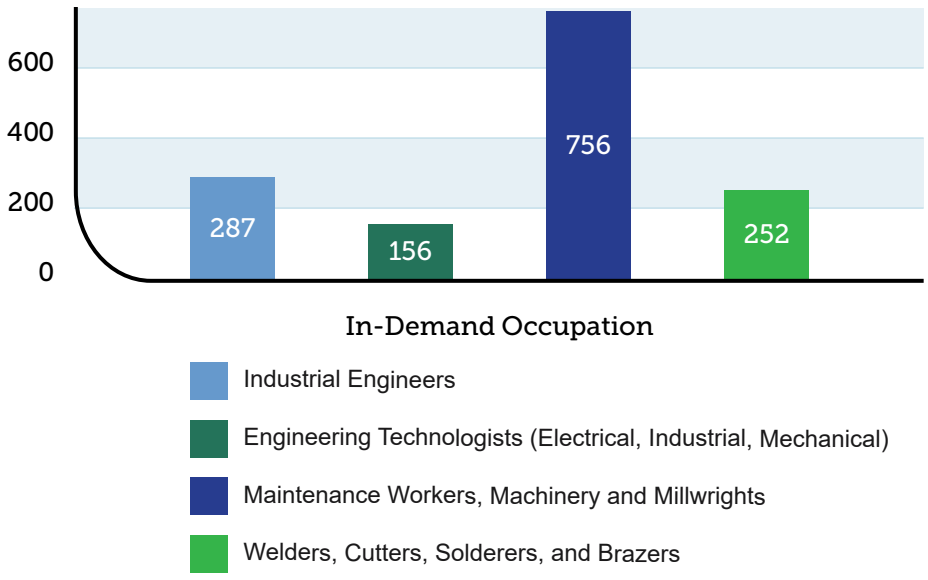
CTE Group	CTE Courses	Classes Offered	Programs Offered
Automotive Technology	3	23	5
Engineering (Design and Technology)	6	11	5
Manufacturing and Machine Systems Technology	7	12	4
Welding	1	15	5

The data indicates that Automotive Technology has the highest concentration, with 23 classes and 5 programs, followed by Welding. Most CTE courses are offered within the Roanoke City and Roanoke County school systems, followed by Alleghany County and shared programs between the Botetourt and Craig County school systems. In addition to the region's CTE offerings, nearly twice as many classes and programs are available in each category as non-CTE courses.

To see the potential impact on in-demand occupations for the TAM industry, CTE courses were grouped under the occupation most aligned with the class.

In-Demand Occupation	CTE Course
Industrial Engineers	Manufacturing Systems
	Materials and Processes Technology
(Electrical, Industrial, Mechanical) Engineering Technologists	Drafting I&II
	Electrical Systems
	Electricity
	Engineering
	Engineering Analysis and Applications
	Engineering Design
	Power and Tech Systems
	Technical Design
	Technology and Robotic Design
	Technology Foundations
Maintenance Workers, Machinery and Millwrights	Auto Body Tech I&II
	Automotive Tech I&II
	Precision Machine Tech
	Small Engine Repair
Welders, Cutters, Solderers,and Brazers	Welding I-III

Region 2 - CTE Credentials Earned[19]
AY 2018 - 2022



The CTE Credential award data highlights strong participation and completion in Engineering courses. Over 100 credentials were achieved each year related to Maintenance and Machinist occupations. The Welding I-III courses are the most highly attended, and according to state reporting, the total of passing students in the region nearly tripled between Academic Year (AY) 2018-2022. Overall, the data underscores the strong demand for automotive and welding programs.

[19] Virginia Department of Education, Credentials Build-A-Table

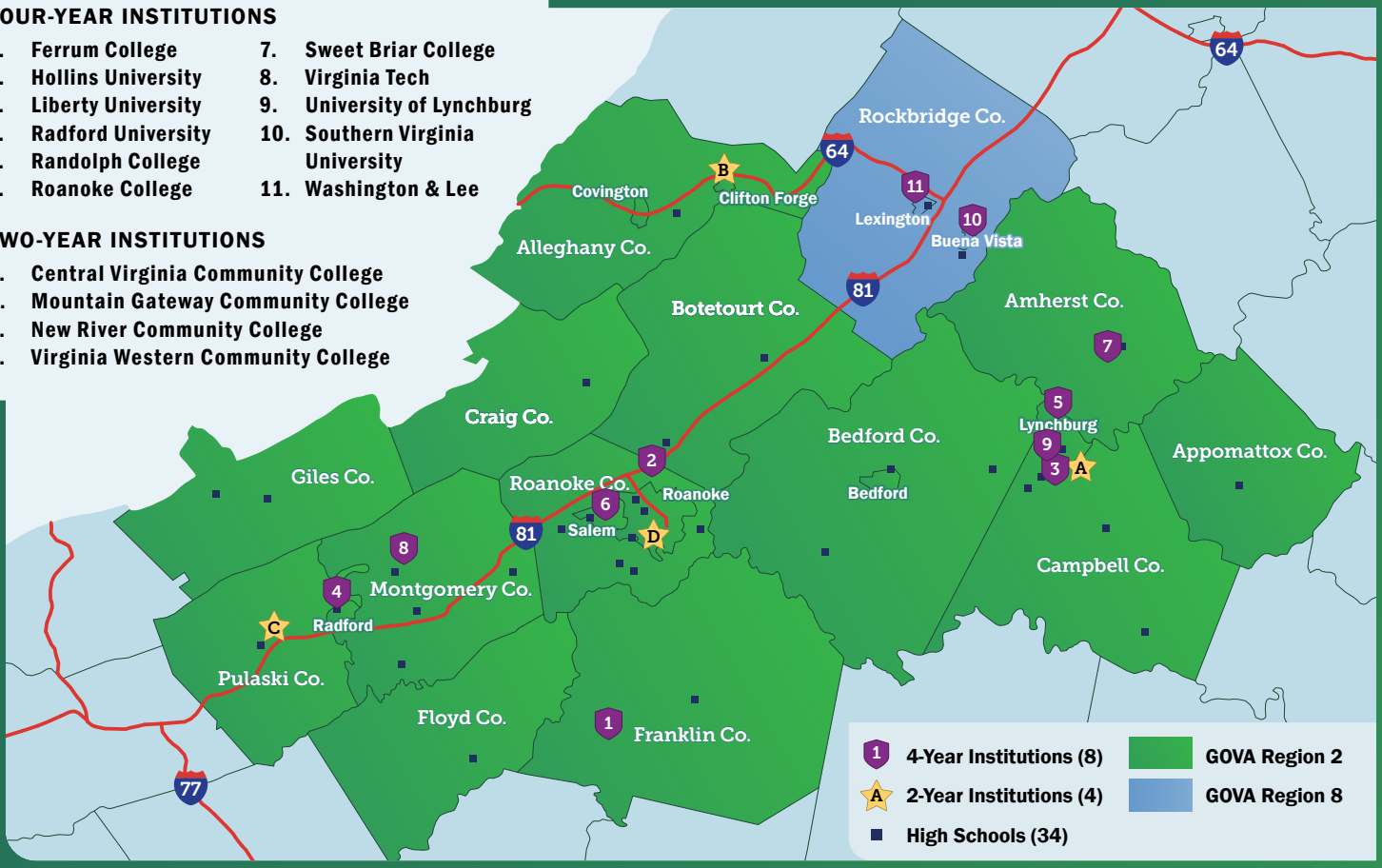
Current Post-Secondary Education Providers

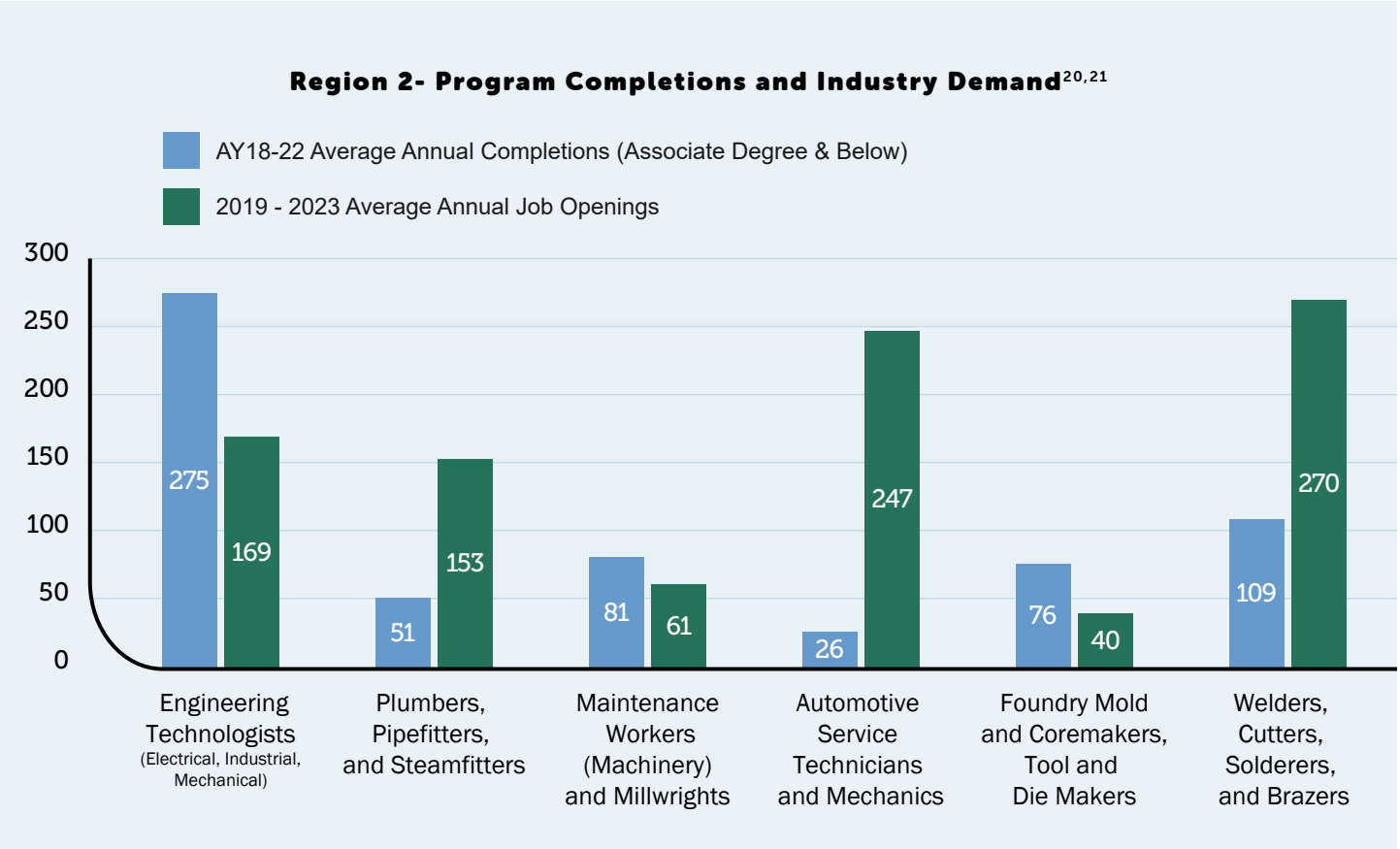
FOUR-YEAR INSTITUTIONS

1. Ferrum College
2. Hollins University
3. Liberty University
4. Radford University
5. Randolph College
6. Roanoke College
7. Sweet Briar College
8. Virginia Tech
9. University of Lynchburg
10. Southern Virginia University
11. Washington & Lee

TWO-YEAR INSTITUTIONS

A. Central Virginia Community College
B. Mountain Gateway Community College
C. New River Community College
D. Virginia Western Community College





Overall, the data indicates a strong emphasis on engineering, manufacturing, and trades to address workforce needs. The completion of two-year degrees or shorter credentials at community colleges in Region 2 frequently falls short of meeting the annual job openings, highlighting the difficulties employers encounter in recruiting skilled talent. The chart illustrates a significant gap in vocational training for maintenance and trade occupations, such as plumbing and welding. While training for these roles can also be pursued at private vocational centers, which are not subject to public reporting, the situation remains concerning. Even when accounting for the contributions from private training centers, more than 20% of the workforce in welding and plumbing is over the age of 55[22].

Notably, in AY 2022, CVCC had the highest program completion rates for Welding Technology (82) and Precision Metal Working (70) in the state. In the same year, NRCC had the highest completion rate in the state for Manufacturing Engineer Technology (34).

In addition to the related technical instruction provided by the VCCS and other regional vocational-technical centers, registered apprenticeship programs allow apprentices to work with companies, gain on-the-job training while earning a wage, and develop the skills necessary to obtain credentials. This model is particularly attractive to high school students, transitioning military personnel, veterans, military spouses, returning citizens, career switchers, and others seeking to advance their careers.

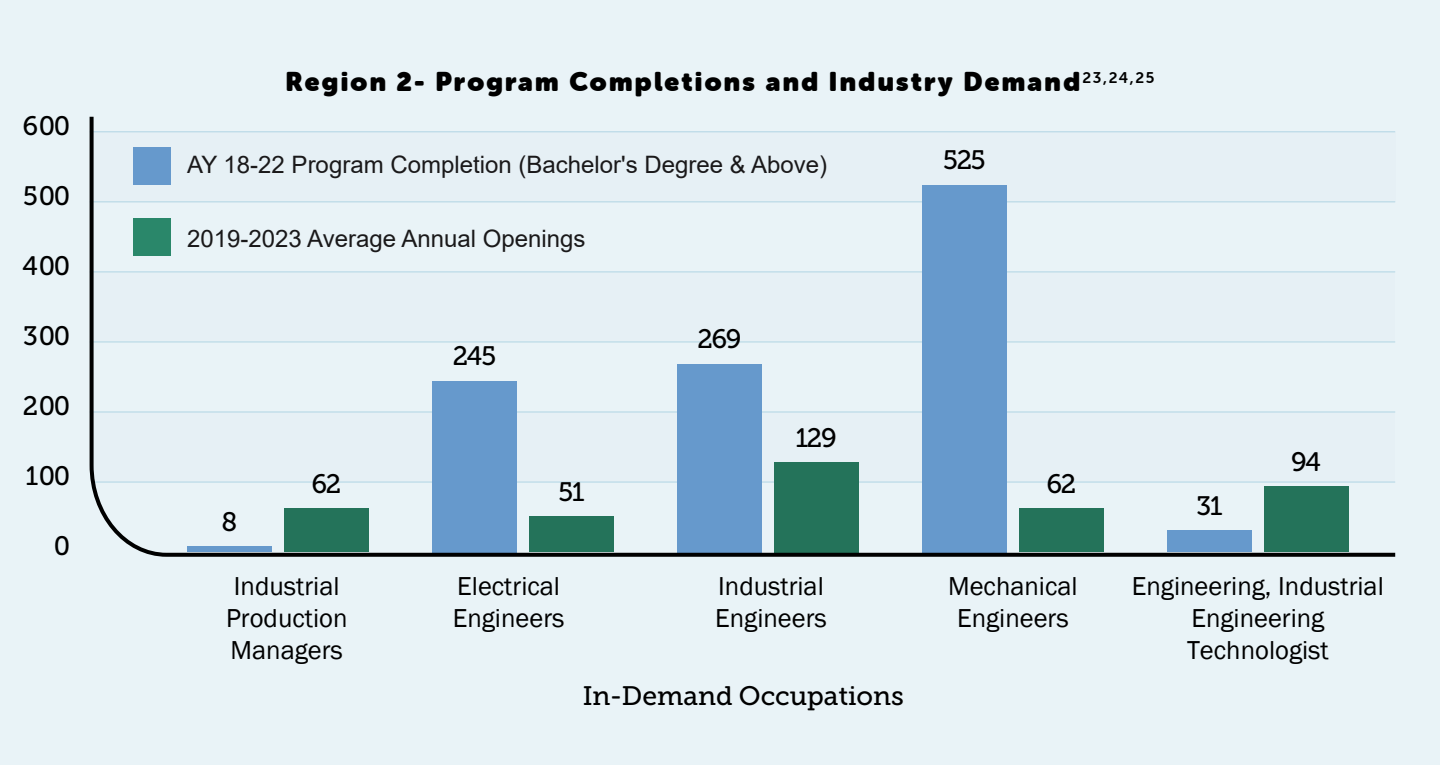
[20] Virginia Office of Education Economics, Virginia Post-Secondary Completion Dashboard

[21] Lightcast, Annual Job Openings Report, 2024

[22] Lightcast Occupation Snapshot, 2024

The nonprofit, four-year institutions offering programs aligned with in-demand engineering occupations in the Transportation Manufacturing and Autonomy industries include Liberty University, Randolph College, Sweet Briar University, and Virginia Tech. While this report focuses on the in-demand occupations employers noted, Ferrum University, Hollins University, Radford University, Roanoke College, and the University of Lynchburg offer Business and Management degrees that could be a pathway to in-demand management roles for these target industries.

Data from private, for-profit higher education institutions is not public and therefore not included in this report. However, Region 2's talent supply may also benefit from East Coast Polytechnic Institute, which offers programs in mechanical engineering as well as business and management, and American National University, which provides a variety of business administration degree programs.



The data on post-secondary degrees awarded on average from AY 2018 to 2022 highlights a strong demand for engineering professionals, particularly in fields like mechanical engineering. Industrial engineering and electrical engineering also show versatility with average annual program completions of around 250. Bachelor's degrees and above, awarded for engineering technologists, are significantly lower than average annual openings, however these occupations often accept educational level of 2-year degrees or less, which the region supplies. Industrial production manager program completion averaged at 8 per year, suggesting niche interest while average annual job openings indicate high demand.

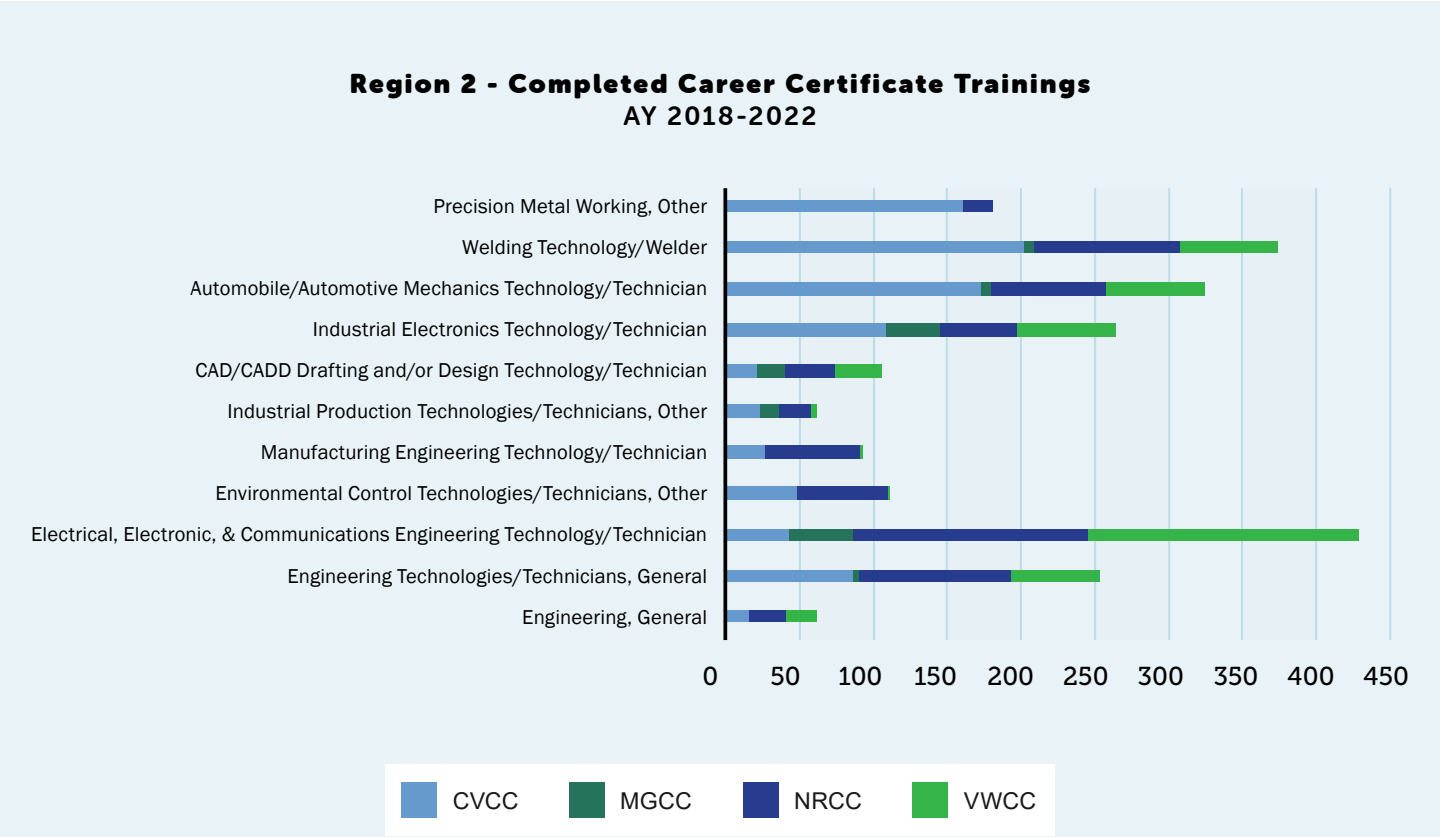
Virginia Tech and Liberty University stand out in both the amount of degree programs offered and degrees awarded. Overall, the institutions display a mix of specialized and broad educational offerings, indicating potential areas for program development and partnerships to host internships or hire students in these programs.

[23] Higher education in the region, especially at Virginia Tech and Liberty, functions as an export business, with many graduates leaving after graduation, highlighting the need to reassess workforce retention expectations and job alignment.
[24] The Virginia Office of Educational Economics, Virginia Post-Secondary Completion Dashboard
[25] Lightcast, Annual Job Openings Report, 2024

The program pipeline indicates a growing interest in in-demand programs, and key training institutions are striving to accommodate workforce needs but are facing barriers to expanding their program capacity. Challenges such as limited physical space to host interested students, restrictions on expanding class sizes for specific programs, and staffing issues are some examples of these obstacles.

Engineering, Trade & Industrial Education, Manufacturing Systems, and Welding are the most offered programs in the region, highlighting a robust commitment to vocational training. In contrast, Technology Education offers 4 programs at the 4-year level, while Transportation, Distribution, & Logistics and Automotive Technology have fewer programs, suggesting lower emphasis or demand.

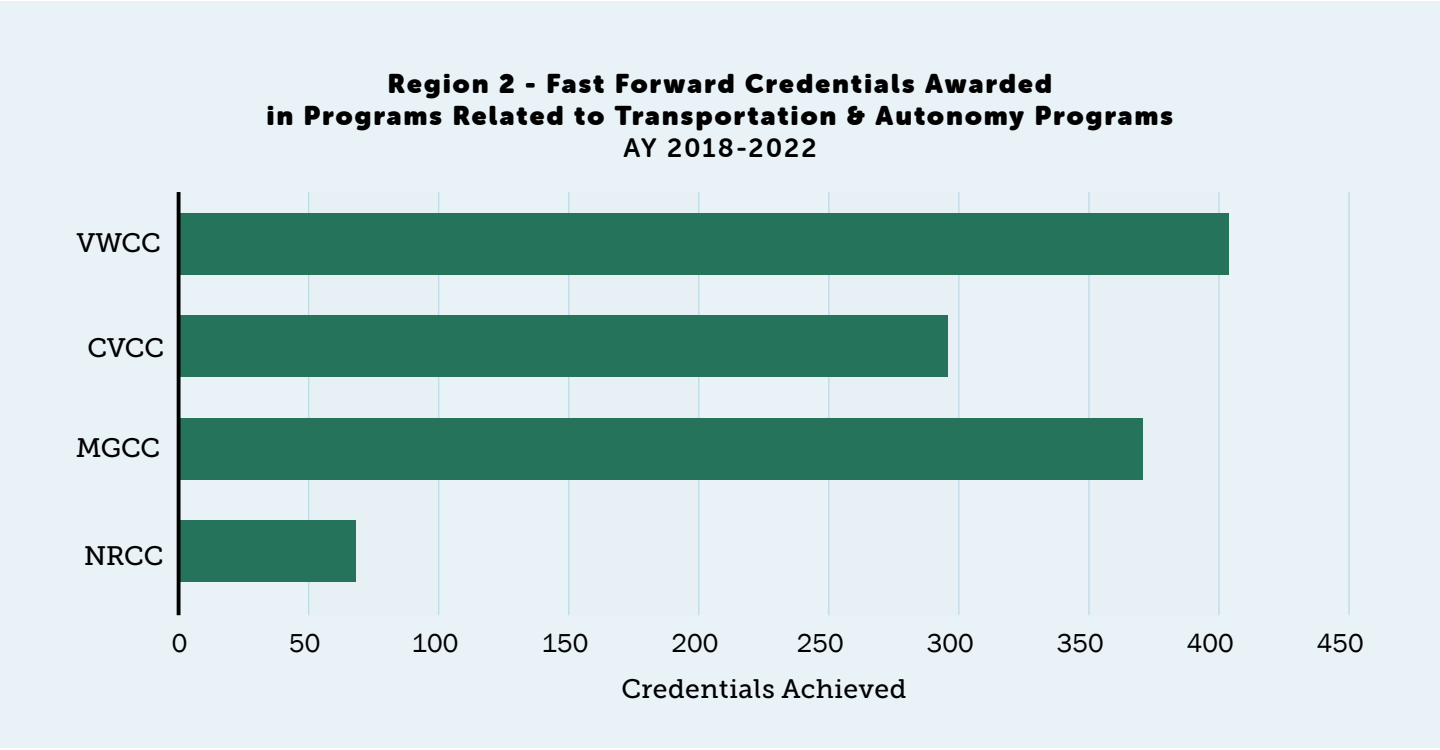
Notably, Machine Technology features a significant disparity with 2 programs at the 4-year level and 16 at the 2-year level, reflecting a need for skilled labor. Architecture & Construction has 5 programs, indicating some educational offerings, while Transportation, Distribution, & Logistics (1) may represent opportunities for expansion in workforce development initiatives. Overall, the data suggests a prioritization of engineering, manufacturing, and trades in addressing workforce needs.



From 2018 to 2022, Region 2 awarded a total of 2,260 career certificate trainings aligning with in-demand occupations, primarily from CVCC (910 awards), followed by NRCC (719). The most popular fields included Electrical, Electronic, and Communications Engineering Technology (429 awards), Welding Technology (374), and Automobile Mechanics (324). CVCC made significant contributions across various fields, particularly in welding and automotive mechanics, while NRCC and VWCC also had strong enrollments in these areas.

Community colleges are significant assets for trade and vocational training for the in-demand occupations. To meet growing workforce needs, VWCC will launch an Autonomous Vehicle Technology Certification program in Spring 2025, and NRCC will expand its Automotive program to emphasize Electric Vehicle maintenance technician training. Both initiatives target in-demand occupations within autonomous and electric transportation systems that require advanced technical skills. Starting in 2021, CVCC invested significant resources to expand their CTE offerings, culminating in over 26 program offerings by 2024. In AY 2020, just over 100 Workforce credentials were awarded by CVCC. In AY 2022, 236 were awarded. The program expansion has been successful but still faces capacity challenges as interested students are waitlisted due to limited instructional space and too few instructors. These challenges are very similar to other regional community colleges with whom we spoke.

FastForward Grant Program



Between FY 2018 and 2023, FastForward credentialing in the region was notably high in NCCER Core - Introductory Craft Skills, HVAC, and Electrical programs, each awarding at least 100 credentials across the four community colleges. Additionally, credentials awarded in welding, Six Sigma Green Belt (beginner-intermediate), millwright and milling operations, and industrial maintenance ranged from 30 to 60. Employers identified these as key skills for in-demand occupations, yet many of these programs are only available in the FastForward format at one or two local colleges.

In contrast, other in-demand skills like Six Sigma Yellow Belt (beginner), production management, and CompTIA programs saw relatively low credentialing, with fewer than 30 credentials awarded from FY 2018 to 2023, and are similarly offered in FastForward format at just one or two colleges.

In addition to traditional post-secondary education providers, this region hosts two training providers that support TAM occupations. The Virginia Technical Institute (VTI), recently acquired by Liberty University, is a technical training institute in Alta Vista VA. Courses at VTI include Electrical, Industrial Maintenance, Plumbing and Welding. Old Dominion Job Corps in Monroe, VA is part of the no-cost educational and vocational training program administered by the U.S. Department of Labor. Training programs at Job Corps in Monroe include Electrical, Plumbing, and Maintenance and Light Repair. Job Corps offers these programs to 16 – 24-year-olds, meeting academic standards, at no cost along with wrap-around service benefits. In addition to acquiring industry-recognized credentials, students must meet Career Success Standards including Career and Personal Planning, Information Management, and Interpersonal Skills.

Proposed Project Concepts

The following concepts for talent-based projects are intended to address a regional challenge for the Life Science & Biotechnology industry clusters and the Transportation & Autonomous Manufacturing industry clusters and offer potential funding sources. These concepts do not limit future GOVA grant applicants from submitting alternative talent-based initiatives.

Many of the following project concepts align with the prioritized strategies and activities outlined for each cluster in the 2023 Region 2 Growth & Diversification Plan. Efforts to address those priority strategies are already underway, developed and implemented by groups like the BRPHSC, AM2 Tech Hubs and other subregional manufacturing groups. These industry-backed consortia will be vital for the implementation of impactful talent initiatives. The concepts shared here are informed by both the established strategies and feedback received from employers in the target industries during this process.

- *Young professionals participating in the Onboard|ROA program enjoying a scenic hike in the Greater Roanoke area. Onboard|ROA is an eight-week summer program that helps interns, new hires, and remote workers aged 18-26 integrate into the Roanoke Region through career readiness courses, social events, and local excursions.*

Photo credit: Onward New River Valley

DEVELOPING A LARGER WORKFORCE PIPELINE THROUGH IMPROVED AWARENESS, HANDS-ON, PROJECT-BASED STEM PROGRAMMING, AND GREATER INDUSTRY ENGAGEMENT

CHALLENGE:

Target industry cluster employers cite a general shortage of talent for machining and manufacturing occupations rather than a skill gap. That worker shortage will continue without increasing the regional talent pipeline. To increase that pipeline, students, parents, and teachers need improved awareness of career pathway opportunities.

GOALS:

1. **Strengthen local educational leaders' understanding of high-paying occupations and regional career pathways. Introduce educators to emerging local industries, including advanced manufacturing and biotechnology. School districts should incorporate insights gained from employer engagement activities into strategic plans that enhance the K-12 to workforce pipeline by boosting skill development and diploma completion in secondary schools.**

2. **Giving students real-life exposure to target industries and skills earlier, ideally through K-12 and post-secondary STEM technical programs that integrate employers and industry workers experiences and knowledge, can inspiring Region 2 students to pursue CTE and dual-enrollment courses in high school that align with regional industry needs. Employers should collaborate with program coordinators to integrate essential skills into student learning and contribute to classroom instruction or on-site demonstrations.**

STRATEGY 1:

Leverage and expand upon existing teacher education programs, integrating a greater emphasis on industry exposure

Continued professional education for teachers is already part of the larger school system as seen through periodic teacher in-service days and train the trainer programs. The programs could be leveraged or expanded to cover programming that exposes teachers to industry and occupation opportunities as well as VDOE-approved curriculum that reinforces industry-required skill sets. One such program, Educator Workforce Academy is described below. School systems could partner with a nonprofit organization that focuses on education and industry alignment, such as Virginia Ed Strategies (VES), described below.

Implementation:

Programs that teach educators about career pathways could be expanded region-wide, encouraging collaboration across school districts and maximizing resources. REDOs or Workforce Development Boards (WDB) could coordinate and host this program, gathering participant feedback to align schools with existing resources or identify new resource needs. GOVA could provide start-up funding for such a program.

Region 2 Best Practice: Educator Workforce Academy & Industry Insights

The Lynchburg Regional Workforce Roadmap highlights successful initiatives like the Educator Workforce Academy (EWA) (Focus Area 1: Career Pathways, Strategic Objective 3: Career Awareness & Perceptions). In August 2024, local manufacturing employers, the Central Virginia Workforce Development Board, and technical/vocational schools collaborated to provide educational leaders—superintendents, CTE instructors, and school counselors—with facility tours, insights into desired entry-level skills, and professional development opportunities. After the Academy, participants crafted action plans to enhance career pathway exploration within their schools. Plans for future Academies aim to involve more educators, such as teachers, in summer events. Similarly, Roanoke County Schools and the Roanoke County Economic Development office hosted Industry Insights, allowing educators to tour companies in the Roanoke Valley.

Support Program: Virginia Ed Strategies

VES focuses on STEM and Math related professional development for teachers to improve education and workforce readiness in Virginia. Key offerings include strategic planning, professional development, technical support for educational programs, and data-driven solutions tailored to schools and organizations. VES partners with businesses to help drive sustainable improvements in student outcomes and workforce alignment. For more detailed information, you can view their offerings directly on the Virginia Ed Strategies website.

STRATEGY 2:

Implement a Regionwide, VDOE-approved STEM curriculum

Several early STEM curriculum models exist that could be effectively tailored to communities across Region 2. Integrating such programs would provide applicable industry experiences from middle school through high school, preparing students for in-demand occupations in Region 2's target industries. Programs should offer hands-on activities for younger students and practical technical training for high school and post-secondary students. One example of a successful program is GO TEC, described below.

Implementation:

In the past, school districts have applied for GOVA Implementation grants to cover GO TEC start-up expenses, with match coming from existing school resources, CTE instructor salaries, and supportive industry partners. County superintendents, CTE directors and instructors, industry representatives, and workforce partners are essential for making this program work. Community colleges are also key partners to support the dual enrollment aspect of the GO TEC program.

Best Practice: Implementing GO TEC in Region 2

Great Opportunities in Technology and Engineering Careers (GO TEC) reinforces STEM skills at the secondary level and inspires student interest and awareness in these fields, Ultimately, GO TEC is designed is to connect secondary education to local employers in STEM fields and attract and grow businesses in targeted sectors. GO TEC has been successful in Region 3 and has expanded to Regions 1, 3, and 4 with additional GOVA funding.

The GO TEC program mainly operates within well-equipped labs set up in middle schools, with a larger regional lab for teacher training and more in-depth fieldtrip or camp experiences. The GO TEC Career Connections program introduces students to five focus areas: precision machining; welding; IT / cybersecurity; robotics, automation and mechatronics; and advanced materials. Healthcare, identified as a regional priority, has also been included within the program. The nine-unit curriculum exposes students to various career pathways and career-specific vocabulary.

Healthcare	**Precision Machining**	**Electrical Engineering**
Automation & Robotics	**Metrology**	**Manufacturing Engineering**
IT Coding & Networking	**Mechanical Engineering**	**Welding**

STRATEGY 3:

Establish Partnerships to Involve Retired Professionals as CTE Instructors.

Encourage partnerships between secondary/post-secondary institutions and target industry employers to recruit retired or near-retirement employees as CTE instructors or "Occupational Specialists." These highly skilled workers can transfer their industry expertise to the next generation. The Virginia Department of Education (VDOE) allows industry-experienced individuals with valid credentials to serve as CTE instructors, even without a 4-year degree. Providing incentives for highly qualified employees to transition into instructional roles could help address the shortage of available instructors, a key barrier to expanding community college programs.

Implementation:

As a convener of regional education and business leaders, AM2 Tech Hub, or the subregional manufacturing consortia, should advocate the benefits of financially incentivizing highly skilled employees to transition into second or third careers as technical instructors. Collaborating with REDOs and WDBs, the consortia could work with regional CTE directors to establish a streamlined pathway for employers to engage with CTE programs. Collaborate with VDOE to provide clear guidance on how retirees can transition into CTE instructor roles. Developing cohesive, shared messaging among regional stakeholders will help drive interest and engagement in this initiative.

ENCOURAGING TALENT ATTRACTION AND RETENTION

CHALLENGE:

Target industry employers find attracting and retaining workforce-ready skilled workers with Bachelor's degrees and above in Region 2 to be a challenge. Many graduates from regional post-secondary institutions seek jobs outside the region, potentially due to limited awareness of local employment opportunities. Young professionals already in the workforce do not see viable career pathways to mid- and high-level positions in the region. Even if they did, they may lack specific technical skills or the managerial skills required for these jobs.

GOALS:

1. **Expose and connect post-secondary students and young professionals to local businesses and workforce programs so they have the knowledge of available career pathway opportunities in their area.**

STRATEGY 4:

Expand existing and build new programming focused on creating relationships between students and employers in the region.

Strengthen connections between Career Services and local employers and industry coalitions like the BRPHSC, Virginia's AM2 Tech Hub, chambers of commerce, technology councils, and regional economic development organizations. These connections ensure up-to-date knowledge of employer needs, qualifications, and hiring preferences that Career Services can convey to students.

Host Internships: Intern-to-FTE Conversion ranks highest for recruitment across industries. Employers can enhance recruitment by creating well-rounded internships, supported by programs in the region. See the Internship Support Program box below for additional information.

Offer mini work-based learning opportunities: To increase student exposure to local employers without the constraints of traditional internships, employers can offer mini work-based learning experiences. These brief engagements could include one-week job shadowing, where students observe professionals in their day-to-day roles without significant time investment from employers. Schools could assign a follow-up project to reinforce students' learning from these experiences.

Internship Support Programs

Virginia Talent + Opportunity Partnership:
Connects businesses with Virginia students and resources for creating internships, with higher education institutions acting as intermediaries.

Roanoke-Blacksburg Technology Council:
Offers guidance to industry specific employers on developing internships beneficial to both students and companies.

Internship-Based Job Readiness Training:
Programs such as **Lynchburg's Beacon of Hope Summer Internship** include a week of job readiness training. Developing soft skills and professional competencies is a central focus, preparing students for successful career entry.

Smaller Local Institutions:
State-level retention rates are often higher for graduates[26] of smaller institutions like Hollins University, Radford University, Roanoke College, and University of Lynchburg.[27]

[26] U.S. Census Bureau. (n.d.). Post-secondary employment outcomes (PSEO) explorer.

[27] Based on 2016-2018 cohort of Baccalaureate graduates in the Biological and Biomedical Science Programs. After one year, at least 70% of graduates remained in Virginia.

STRATEGY 5:

Expand Complementary Internship/Young Professional Talent Programs

Young professional programs should offer continuing professional development, professional networking opportunities and community building events to strengthen the connection of early-career professionals to this region. These programs should work with regional businesses to provide clear pathways to mid and senior roles (requiring a formal education) available in this region. Models already exist in the New River Valley, Roanoke and Lynchburg, as described below.

Implementation:

A GOVA Talent Development, Attraction, and Retention Planning grant could support establishing additional services. An implementation grant could be used to support the expansion of an existing program.

Other partners or host organizations that could create attraction/retention incentive programs: Virginia Economic Development Partnership, local chambers of commerce, private business sponsors, universities, etc.

Young Professional Programs

Onward New River Valley hosts NRV Experience, a complimentary program for undergraduate summer internships. This program offers professional development workshops and connects summer interns (especially those students from out of Region 2) to the area through excursions and community service.

Leadership Lynchburg hosts Leading Off Campus, a complimentary program for undergraduate students with internships and graduate students with limited work experience in the Lynchburg area. The program includes networking events, community exploration, and core competency workshops.

The **Roanoke Regional Partnership** hosts Onboard|ROA for young professionals under the age of 26. This program not only includes interns, but also those with full-time employment with a local employer, and young professionals who recently relocated or work in the area remotely.

Roanoke-Blacksburg Technology Council steers ChangeMakerZ, a 12-month cohort program focused on professional development for early-career STEM professionals.[28] Members of the cohort advance their skills and career in the continued education through custom training in Artificial Intelligence or other career-related technologies. Along with a financial incentive for completing the program, members gain access to professional networking events and conferences to create valuable connections in their profession and in the region.

[28] For individuals within 5 years of completing an associates, bachelors, masters, or doctoral degrees in a STEM field, or will complete their degree by June 1, 2025. Candidates must be employed by, or be seeking remote work with, a company with headquarters or operations in Virginia. Preference is given to candidates in technology or biotechnology who are living and working within the GOVA Region 2 area.

STRATEGY 6:

Develop a Talent Retention Initiative for Middle-skilled Talent

There is a strong need to identify career pathways for middle-skilled occupations within Region 2's manufacturing sector to retain locally trained talent. Similar to the efforts of the BRPHSC and the New River|Mount Rogers WDB to map career pathways (see pages 58 and 69 in Appendix), AM2 Tech Hub could develop detailed career maps for manufacturing roles, outlining pathways from entry-level to senior positions with required credentials along the way. These career lattices would be utilized at the secondary education level for students and educators, to heighten awareness of middle-skilled, high-paying occupations in the region. This would ensure clear direction for those entering the workforce after high school. These lattices would also be valuable for community colleges or private vocational training centers to guide traditional students and adults changing careers and illustrate the value of stackable credentials and the available courses at each training institution. Similarly, businesses can use the lattice to provide clarity to existing workers of professional development opportunities within the company and the necessary training and local providers.

Implementation:

Community colleges, industry consortia like the AM2 Tech Hub, and REDOs can partner with local manufacturing employers to create retention incentives for recently trained or hired workers. These incentives could include sign-on bonuses, tuition reimbursement, and recognition programs that celebrate professional milestones. Additionally, partnerships with community college workforce offices, industry consortia, and economic development organizations could help businesses create or expand professional development and mentorship programs to support talent retention and company growth. Industry-specific training, developed in collaboration with community colleges, could also enable workers to progress to mid- and senior-level roles. VEDP's expertise in targeted worker attraction would support the expansion or creation of regional retention programs for middle-skilled workers.

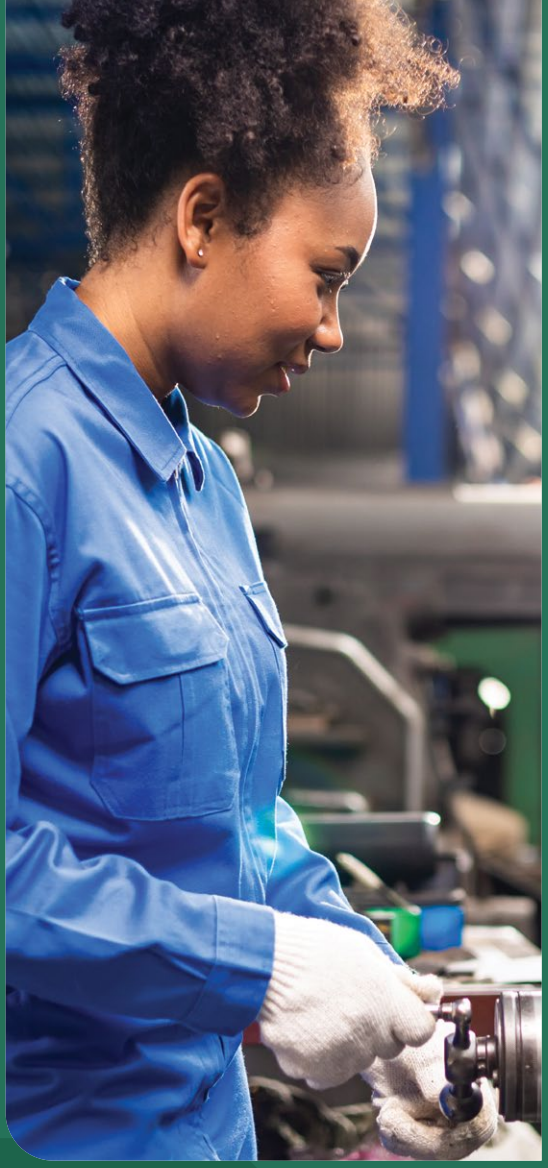
STRATEGY 7:

Increase Company Engagement with Existing Training Programs

Target industry employers can collaborate with regional community colleges to utilize existing upskilling programs through dedicated Workforce Solutions offices at each institution. These offices offer customized training and professional development, including technical courses taught by subject matter experts. (See Resource Guide for Business Solutions contacts.)

Virginia Western Community College Compact Courses

VWCC offers compact courses such as a 15-hour cell culture training for students and custom week-long lab training for interns, offering practical skill development. A variety of day-long professional development courses such as Critical Thinking in Manufacturing are also available for both employers to enroll employees or for individual enrollment.



BRINGING HARD-TO-REACH POPULATIONS BACK INTO THE WORKFORCE

CHALLENGE:

With an ever-tightening labor market, target industry employers require a larger pool of workers. However, because of many challenges, a good portion of eligible workers leave the labor force.

Challenges include:

1. **Behavioral, physical, intellectual, or development disorders that prevent adults from working without extra support and coaching.**
2. **Lack of access to affordable childcare services for workers with children.**
3. **Lack of access to basic amenities such as transportation and housing.**
4. **Workforce experiences that have led adults to be discouraged about their economic prospects and employability.**

GOALS:

1

Reintegrate hard-to-reach populations into the workforce through targeted training, wrap-around support services, and guaranteed job placement.

STRATEGY 8:

Develop short, rigorous adult learning programs with support for wrap-around services to bring hard to reach workers back into the workforce.

These programs should work to accommodate worker needs such as childcare for parents, rehabilitative services for people with disabilities, or transportation and housing for those without access. Additionally, programs should provide stipends to support these adult learners who are gaining new skills and transitioning to new career paths, with guaranteed job placements through partnerships with participating companies. Already, certain models existed that could be adapted to serve the workforce needs of life science, biotechnology, and transportation & autonomous systems manufacturing companies.

Implementation:

A regional Workforce Development Board could apply for a GOVA Planning or Implementation Grant, supported by a nearby community college and regional nonprofits that assist hard-to-place workers or caregivers of young children seeking to gain new skills. This grant would fund planning or implementation of a pilot program, starting with a small cohort and guaranteeing job placement at one or two partner businesses. By demonstrating return on investment (ROI) through this pilot, the program can attract increased engagement from regional employers. Future funding and support could come from organizations like Goodwill Industries of the Valleys, Virginia CARES, Recover VA, or People Incorporated.

Virginia Department of Corrections Job Training Services

At the St Brides Correctional Center in Chesapeake, VA, an Automotive Technology and Service job training program is available for inmates. The job training program takes 14 months, in preparation for the Automotive Service Excellence (ASE) certification exam.

Manufacturing and Technical Community Hub

The manufacturing training program offers skills like welding and CNC machining in English and Spanish. It starts with a two-week paid training period, followed by up to six weeks of paid on-the-job training, based on specialty. The program is designed to be accessible, requiring no prior experience and targets parents, particularly women, offering family-friendly hours that align with school schedules. It partners with local initiatives, such as New Haven Healthy Start's Fatherhood Involvement project, to engage participants. The program aims to be self-sustaining within 3-5 years, with plans for future expansion and leadership transition to a younger generation.

Biotechnology Bootcamp

Columbus State Community College launched a Biotechnology Bootcamp to support the biotechnology manufacturing industry in Columbus, Ohio. The 12-week program ensures participants gain the skills necessary to pursue a well-paying career. The program specially targets military veterans, career-changers, high school and career-technical graduates, those with a high school diploma.

GROWING THE SUPPORT ECOSYSTEM FOR BUSINESSES TO BETTER ACCESS, DEVELOP, AND ATTRACT TALENT

CHALLENGE:

Many local startups have difficulty accessing all the region's talent resources, largely because they are understaffed and do not have enough time to invest in business development. Startups, for instance, are often run by the founder/owner, managing multiple roles—such as financial accounting, marketing, and business administration—in addition to technical duties. These entrepreneurs have strong technical expertise but often lack business experience, limiting their ability to focus on growth. As the regional entrepreneurial ecosystem grows, startups will need more support services.

GOALS:

1. **Create an ecosystem that offers more easily accessible resources to businesses, such as C-suite executive support to manage business functions, sourcing investment, recruiting talent, and connecting with support networks.**

STRATEGY 9:

Build digital and physical hubs of support for employers

Design and develop a user-friendly website by collaborating with regional stakeholders, incorporating search and filter options for easy navigation. Aggregate and clearly present regional workforce resources to ensure that employers have quick access to actionable information. For promotion and outreach, project partners and local organizations can market the hub effectively and provide demonstrations to increase employer engagement. Finally, maintain the hub with regular content updates and feedback integration, exploring funding support to ensure sustainability and potential future enhancements.

Implementation:

Sharing those resources, even at a subregional level, is a labor-intensive process that requires continuous updating, but it's a worthy endeavor. If a regional resource is not feasible, a robust sub-regional guide for the NRV would be a valuable resource. Funding opportunities may be available through GOVA through a Talent Retention and Attraction grant.

STRATEGY 10:

C-Suite for Hire

Develop a regional program providing access to fractional C-suite executives could help small businesses scale by enabling founders to focus on technical development and training. This executive support would also make startups more attractive to external investors. The 2021 Region 2 Strategic Investment Plan proposes that Innovate Lynchburg, the Roanoke-Blacksburg Technology Council, regional chambers of commerce, and SBDCs collaborate to support this initiative.

Implementation:

An Entrepreneurship and Business Development GOVA grant could fund fractional executive costs and initial program development.

Best Practices:

The recently launched Get2KnowNoke.com serves as a comprehensive resource hub, organizing a wealth of resources and connecting employers to relevant services. The Lynchburg Regional Business Alliance also plans to launch an online resource hub for businesses as part of their Career Pathways Development GOVA grant. Both initiatives aim to provide an organized, accessible guide to resources.

The Shenandoah Valley Partnership offers an easy-to-find, curated list of workforce and training resources for both employers and job seekers, along with detailed guidance to those resources. The Shenandoah Valley Partnership is a REDO collaborative that covers nearly all of GOVA Region 8.

Appendix

LIST OF ABBREVIATIONS

AM^2	Additive Manufacturing & Advanced Materials Tech Hub
AY	Academic Year
CC	Community College
CTE	Career and Technical Education Programs
GO TEC	Great Opportunities in Technology and Engineering Careers
GOVA	Growth and Opportunity Virginia
GRP	Gross Regional Product
LQ	Location Quotient
MSA	Metropolitan Statistical Area
OEM	Original Equipment Manufacturer
REDO	Regional Economic Development Organization
TPI	Talent Pathways Initiative
VDOE	Virginia Department of Education
VT CECE	Virginia Tech Center for Economic and Community Engagement
WDB	Workforce Development Board

METHODOLOGY

The project team identified regional employers by reviewing companies classified under relevant North American Industry Classification System (NAICS) codes and analyzing job postings for top in-demand occupations. Businesses outside the specific NAICS codes were included if they offered roles on the career pathways for those high-demand occupations.

Education asset mapping was a strategic process used to identify and assess the resources, programs, and capacities of educational institutions within GOVA Region 2. The objectives of this mapping are threefold:

1. **To detail the existing landscape of training providers specializing in each industry cluster.**
2. **To evaluate the current capacity and resources of these training providers.**
3. **To forecast the projected growth and capacity changes over the next five years, highlighting potential areas for development and investment.**

This process was crucial for understanding the current landscape of training providers and their ability to meet the evolving demands of each industry.

To categorize the extensive list of CTE programs and classes in Region 2, every available CTE website and source was reviewed, resulting in a comprehensive spreadsheet. This organized approach provided clear insights into the educational opportunities available. Despite our efforts to gather data from the State Council of Higher Education for Virginia and the VDOE, inconsistencies in CTE data reporting persisted. Therefore, it was crucial to validate this information through direct consultation with contacts, schools, and businesses.

A workforce analysis assessed the demand for skilled workers across entry to senior-level positions over the next five years. This analysis highlighted job growth trends and workforce gaps, ensuring alignment between educational programs and industry needs in each industry cluster. Additionally, education asset mapping evaluated training providers and their capacity to meet industry demands, identifying gaps and forecasting future needs.

Implementation partners provided feedback to refine the workforce analysis. Meetings were held with industry stakeholders to address the alignment between educational programs and workforce needs. Employer outreach, in collaboration with local partners, was conducted through various methods to ensure broad engagement. Focus groups, surveys, and interviews with employers between April and August 2024 gathered qualitative insights into workforce challenges. Employer engagement was limited, with a response rate of just over 50%. Despite extended outreach efforts, some insights were missed, which may have affected the depth of the analysis.

Life Science Company List

Companies
Carilion Clinic
Fralin Biomedical Research Institute
CytoRecovery
The Tiny Cargo Company
Acomhal Research
LymphaVibe
Intuitive Surgical
TECHLAB, Inc.
Qentoros
Luminary Therapeutics
Qurcan Therapeutics, Inc.
Bacchus Therapeutics
Novozymes
Centra Health
Abbot Laboratories
Biotherapeutics
Revivicor
Precigen, Inc.
Skyphos
Chorda Pharma
Soltas Lab Partner
Genuin Biotech
Quest Diagnostic
Pathgroup Labs
HCA Healthcare (Lewis Gale)
Genentech
VT COgro Labs
Landos Pharma
Teva Pharmaceuticals

Executive Summary:
Focus Group for Biotechnical Companies Talent Needs (April 2024)

Overview:

Three focus group sessions were planned in Roanoke, Blacksburg, and Lynchburg in April, 2024. The session in Roanoke (4/15/24) was canceled due to lack of RSVPs. The session in Lynchburg (4/10/24) was shortened considerably due to a scheduling conflict with a last-minute high-profile event in the same building. This session predominantly ended up being an informational session for the participants. In the Lynchburg and Blacksburg sessions, the TPI coordinator and manager were supported by project implementation partners including organizational leaders, local workforce development boards and economic engagement centers.

The following summary is based on the Blacksburg session, with a total of 3 local businesses participating. The discussion centered on talent acquisition, education alignment, and strategies for retaining skilled workers in the biotechnical sector.

Key Themes:

1. Talent Acquisition and Retention:

- Employers highlighted the difficulty of hiring and retaining talent, particularly for highly skilled roles. Many companies struggle to compete with larger biotech hubs like Research Triangle Park (RTP) in North Carolina due to differences in salary, growth opportunities, and lifestyle offerings.
- The lack of affordable housing and limited social opportunities for young professionals in the region was seen as a barrier to attracting and retaining employees.
- Participants stressed the importance of internships and hands-on experiences in helping students transition into full-time roles. One notable example was a company that retained an intern due to a strong team environment and continued mentorship.

2. Education and Training Alignment:

- There was significant discussion on the need for better alignment between educational programs and industry needs, especially in terms of practical lab skills and certification programs. Cleanroom experience and Good Manufacturing Practice (GMP) knowledge were frequently cited as critical gaps in the current training pipeline.
- While there are programs at local institutions, many felt that these do not fully meet industry requirements, and some companies are forced to send employees out of state for specialized training.
- The group expressed interest in more flexible, stackable credential programs that would allow employees to enter the workforce with basic skills and continue learning while employed.

3. Infrastructure and Resources:

- Several startup owners raised concerns about the lack of suitable lab space in the region. While some spaces exist, they often do not meet the needs of growing companies, particularly in terms of specialized equipment and safety requirements (e.g., cleanrooms, GMP facilities).
- Comparisons were made to fully equipped lab spaces available in larger biotech hubs like RTP, where companies can lease turnkey labs instead of investing heavily in infrastructure. There was a desire for similar models in the region to help startups scale without relocating.
- There was also concern about the high cost of building or modifying lab spaces, with some participants considering relocation to better-equipped regions.

4. Regional Collaboration and Support:

- Participants acknowledged the role of regional programs such as the Blue Ridge Partnership for Health Science Careers and GO Virginia in fostering collaboration between industry, education, and workforce development. However, they stressed the need for more targeted efforts to support the biotech sector specifically.
- The idea of creating stronger ties with Virginia Tech and other local institutions was seen as essential, but several participants noted challenges in navigating university-industry partnerships, particularly around access to lab facilities and managing intellectual property concerns.

Conclusion:

The focus group revealed a strong demand for workforce development tailored to the unique needs of the biotechnical industry. Key priorities include enhancing internship and training programs, improving lab infrastructure, and fostering collaboration between local businesses, educational institutions, and regional development initiatives. Addressing these challenges could help the region retain and attract the talent needed to support the growth of its biotechnical sector.

Executive Summary:
Interviews with Life Science & Biotechnology Companies

Overview:

Between March and August 2024, two national companies with locations in Region 2, a handful of industry leaders, and small business owners in the Life Science and Biotechnology industry were interviewed. All interviews followed the same interview protocol but were predominantly informal and allowed the interviewee to elaborate on how to address the skills gap in Region 2. In some interviews, the focus shifted to how to support the nascent portion of the industry in our region, as many start-ups and small businesses do not host full-time jobs at their current stage of maturity. Specific skills needed and regional gaps were the focus when interviewing mature regional employers with more employees.

1. Challenges in Talent Acquisition and Skill Gaps

- Across interviews, a recurring theme is the difficulty in finding qualified talent with specific skills, particularly in areas like laboratory work, regulatory affairs, commercialization, and industrial applications of biotechnology. Both established companies and startups experience challenges in sourcing candidates who have the required mix of technical expertise and practical experience.
- While some companies are open to hiring candidates with high school diplomas or associate degrees for entry-level roles, provided they possess the necessary soft skills and are willing to learn, others prefer candidates with at least a bachelor's degree, especially for roles involving complex laboratory work. The mismatch between local educational outputs and specific industry needs is a barrier to filling these gaps efficiently.

2. Need for Multi-Disciplinary Skills

- There is a growing demand for professionals who can handle laboratory work while also managing regulatory, commercialization, and administrative tasks.
- Some companies focus on hiring candidates who have specific technical expertise and then cross-train them in other areas, while others emphasize the importance of creating educational programs that integrate science, business, and regulatory affairs to develop these hybrid skills from the start.

3. Importance of Collaboration and Partnerships

- Collaboration between companies, educational institutions, and other stakeholders is seen as vital for fostering innovation, developing talent, and addressing skill gaps. Partnerships help bridge the gap between academic training and industry needs, offering hands-on experiences that better prepare graduates for the workforce.
- Companies that participated in the interviews have different preferences regarding the type of partnerships. This predominantly depended on the business's needs and most needed occupations. Some advocate for closer collaboration with commercial entities, like healthcare providers, to gain practical market access, while others emphasize university or vocational school partnerships that combine educational training with real-world applications.

4. Internal Training and Development Programs

- A few organizations have developed robust internal training programs, including on-the-job training, mentorship, and professional development opportunities, to upskill current employees and address gaps in specific technical knowledge areas.
- A downside to the organizations which use structured professional development programs (that involve rotational assignments across the country), is that skilled talent is removed from the region. One company notes its workforce would benefit from certified trainers providing consistent training aligned with company-specific needs.

5. Recruitment Challenges in Less Urbanized Regions

- Attracting talent to less urbanized areas remains a significant challenge. Potential candidates are reluctant to relocate to regions perceived as offering fewer professional opportunities or personal amenities. This is particularly true for roles that require specialized skills not commonly found locally.
- Some organizations are focusing on, or see potential in, building a local talent pipeline through early engagement with schools and offering internship and apprenticeship programs to encourage young talent to stay in the region. Continuing to focus regional efforts on attracting and or retaining candidates from broader geographies is vital.

6. Role of Education and Specialized Programs

- There is a strong emphasis on the need to develop specialized educational programs that are closely aligned with the needs of the (relatively nascent) biotechnology sector. These could include more interdisciplinary programs that combine scientific, technical, business, and regulatory training.
- While some stakeholders believe that partnerships with educational institutions should focus on early STEM education to cultivate interest, others suggest creating more advanced, specialized programs to directly address industry needs.

7. Funding and Investment Alignment

- Access to funding and investment alignment is a critical challenge for startups and smaller companies in the biotechnology sector. This often is a barrier for these companies to host full-time occupations. More local investment is needed to support regional business growth and sustainability.
- Some suggest attracting seed businesses through financial incentives and incubator programs, while others emphasize the need for more grant funding and support in navigating regulatory and commercialization pathways. The difference of opinion is likely due to the interviewees' personal experience with being an entrepreneur in the regional life science and biotechnology industry.

Conclusion

The interviews collectively reveal that the life sciences and biotechnology sectors face both shared and unique challenges in workforce development, talent acquisition, and alignment with educational institutions. While there are common needs for multi-disciplinary skills, collaboration, and internal training, the approaches to addressing these needs vary significantly depending on the specific organizational focus, geographic location, and industry niche. A tailored strategy that leverages regional strengths, enhances educational programs, and builds stronger partnerships between academia and industry will be essential to overcoming these challenges and fostering a robust biotechnology ecosystem in the region.

Executive Summary:
Life Science & Biotechnology Surveys

This executive summary provides insights from employer surveys completed by representatives of companies or support organizations within the Life Science and Biotechnology industry. The focus of the surveys was to understand current talent needs, recruitment challenges, and develop potential strategies to better align regional education and training programs with employer needs.

Q5. Please rank how much the following talent attraction and retention challenges are affecting your company:

	Not at all	Slightly	Moderately	Very	Extremely
Multiple job openings now	2	1	0	2	0
	40%	20%	0%	40%	0%
Upcoming expansions (2-5 years)	1	1	1	2	0
	20%	20%	20%	40%	0%
Employees leaving or aging out	1	2	2	0	0
	20%	40%	40%	0%	0%
Lack of critical skills/ knowledge in talent pool	1	1	1	1	1
	20%	20%	20%	20%	20%

Q6. What occupations are currently highest in demand?
Biological and Laboratory Technicians

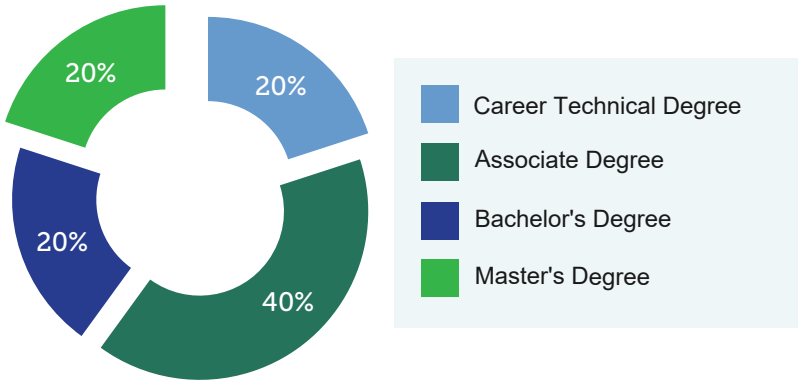
Q7. What occupations will be highest in demand:
Veterinary Technicians, Automation Engineers, Technicians with a variety of specializations, Entrepreneurs

Q8. For the in-demand occupations, what technical skills will be required?
Advanced skills (wet lab proficiency, large animal experience, molecular biology, robotics)

Q9. In the next two to five years, do you anticipate a growing demand for a specific position(s) in the larger Life Science/Biotechnology industry?
All respondents answered yes.

Q10. What is a general title for that position(s) and what technical skills will be required?
Highly skilled scientists; more programming training.

Q11. Currently, what is the lowest level of education accepted for entry-level skilled Life Science or Biotechnology positions at your company?



Q12. Please select your company's use of each recruitment method and rank the success of each method for hiring successful candidates.

Statement	Unsuccessful	Somewhat successful	Successful	Very Successful	NOT Utilized
Online Job Boards (e.g., Indeed, Zip Recruiter, Industry Association sites)	0	2	2	1	0
	0%	40%	40%	20%	0%
Internship Programs (Interns offered FT positions after completion)	2	1	1	1	0
	40%	20%	20%	20%	0%
(Public) Career Fairs	4	0	0	0	0
	100%	0%	0%	0%	0%
(College) Career Fairs	2	2	0	0	0
	50%	50%	0%	0%	0%
Through word of mouth	1	1	1	2	0
	20%	20%	20%	40%	0%
Candidates applying directly to company website	2	1	1	1	0
	40%	20%	20%	20%	0%

Q13. In what ways do you currently partner with academic institutions?

Statement	Central Virginia CC	Mountain Gateway CC	New River CC	Virginia Western CC	Ferrum College	Hollins University
Host interns	0	0	1	1	0	0
	0%	0%	25%	25%	0%	0%
Recruit graduated talent	0	0	1	2	0	0
	0%	0%	9.09%	18.18%	0%	0%
Advise curriculum development	0	0	1	1	0	0
	0%	0%	33.33%	33.33%	0%	0%
Employee serves as an adjunct instructor	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	1	0	0
	0%	0%	0%	50%	0%	0%

Statement (continued)	Liberty University	Radford University	Radford University Carilion	Randolph College	Roanoke College
Host interns	0	1	0	0	0
	0%	25%	0%	0%	0%
Recruit graduated talent	0	1	0	0	0
	0%	9.09%	0%	0%	0%
Advise curriculum development	0	1	0	0	0
	0%	33.33%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	0	0
	0%	0%	0%	0%	0%

Statement (continued)	Sweet Briar College	University of Lynchburg	Virginia Tech	Virginia Tech Carilion	Fralin Biomedical Research Institute
Host interns	0	0	1	0	0
	0%	0%	25%	0%	0%
Recruit graduated talent	0	0	3	2	2
	0%	0%	27.27%	18.18%	18.18%
Advise curriculum development	0	0	0	0	0
	0%	0%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	1	0	0
	0%	0%	100%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	1	0
	0%	0%	0%	50%	0%

Q14. In what ways would you like to partner with academic institutions?

Statement	Central Virginia CC	Mountain Gateway CC	New River CC	Virginia Western CC	Ferrum College	Hollins University
Host interns	0	0	0	1	0	0
	0%	0%	0%	20%	0%	0%
Recruit graduated talent	0	0	0	1	0	0
	0%	0%	0%	7.69%	0%	0%
Advise curriculum development	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	0	0	0	0
	0%	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	1	0	0
	0%	0%	0%	16.67%	0%	0%

Statement (continued)	Liberty University	Radford University	Radford University Carilion	Randolph College	Roanoke College
Host interns	0	0	0	0	1
	0%	0%	0%	0%	20%
Recruit graduated talent	0	1	1	0	1
	0%	7.69%	7.69%	0%	7.69%
Advise curriculum development	0	0	0	0	0
	0%	0%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	0	1
	0%	0%	0%	0%	16.67%

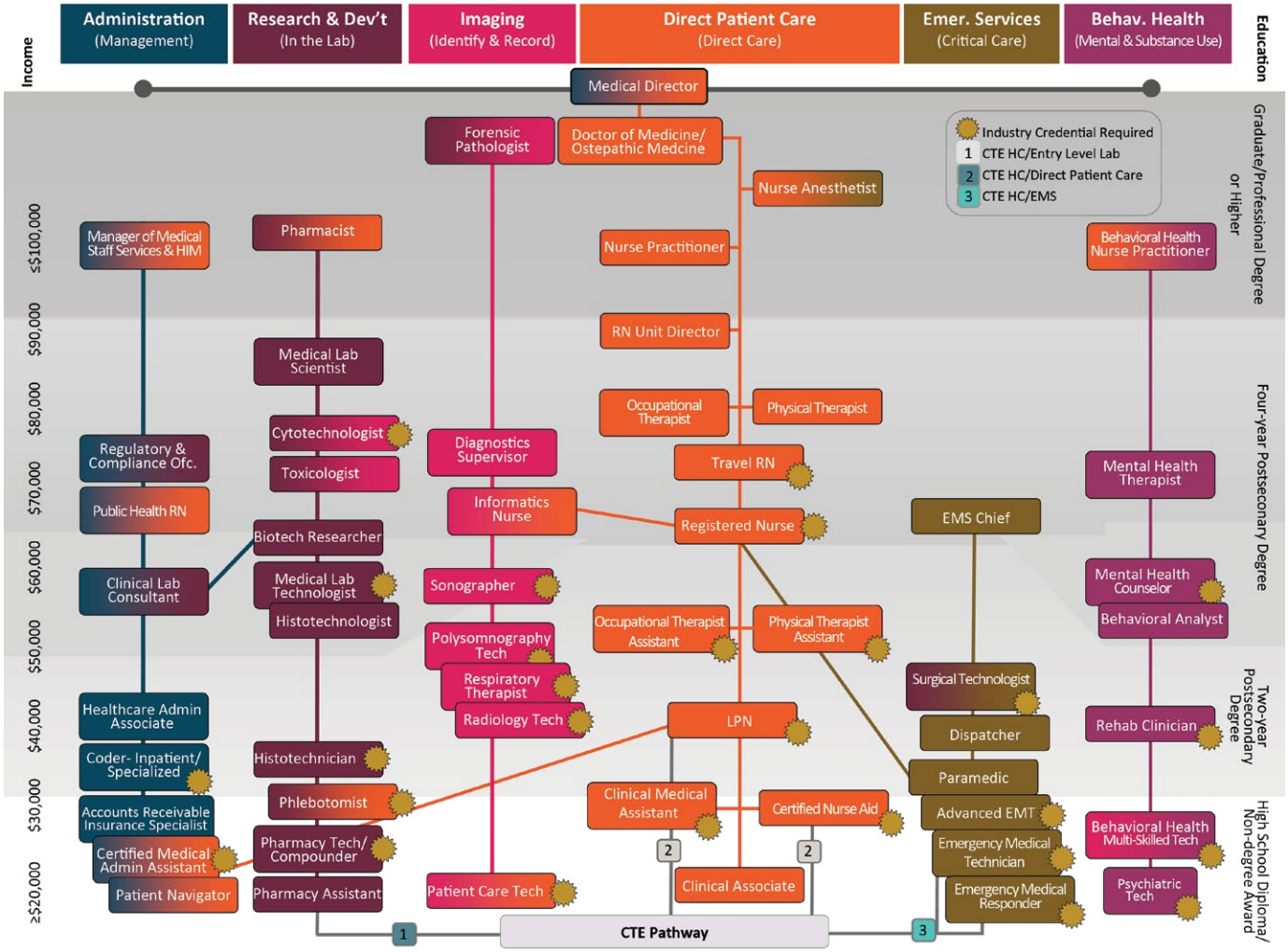
Statement (continued)	Sweet Briar College	University of Lynchburg	Virginia Tech	Virginia Tech Carilion	Fralin Biomedical Research Institute
Host interns	0	0	1	1	1
	0%	0%	20%	20%	20%
Recruit graduated talent	0	1	2	3	3
	0%	7.69%	15.38%	23.08%	23.08%
Advise curriculum development	0	0	0	0	0
	0%	0%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	1	0	0
	0%	0%	100%	0%	0%
Host externships to academic instructors to learn current industry	0	1	1	1	1
	0%	16.67%	16.67%	16.67%	16.67%

Top In-demand Occupations

SOC Code	Description
17-2031	Bioengineers and Biomedical Engineers
17-2040	Chemical Engineers
17-2112	Industrial Engineers
17-3023	Electrical and Electronic Engineering Technologists and Technicians
17-3026	Industrial Engineering Technologists and Technicians
17-3027	Mechanical Engineering Technologists and Technicians
19-1021	Biochemists and Biophysicists
19-1022	Microbiologists
19-2031	Chemists
19-4021	Biological Technicians
19-4031	Chemical Technicians
29-2010	Clinical Laboratory Technologists and Technicians
31-9096	Veterinary Assistants and Laboratory Animal Caretakers
49-9041	Industrial Machinery Mechanics
49-9043	Maintenance Workers, Machinery
51-9110	Packaging and Filling Machine Operators and Tenders

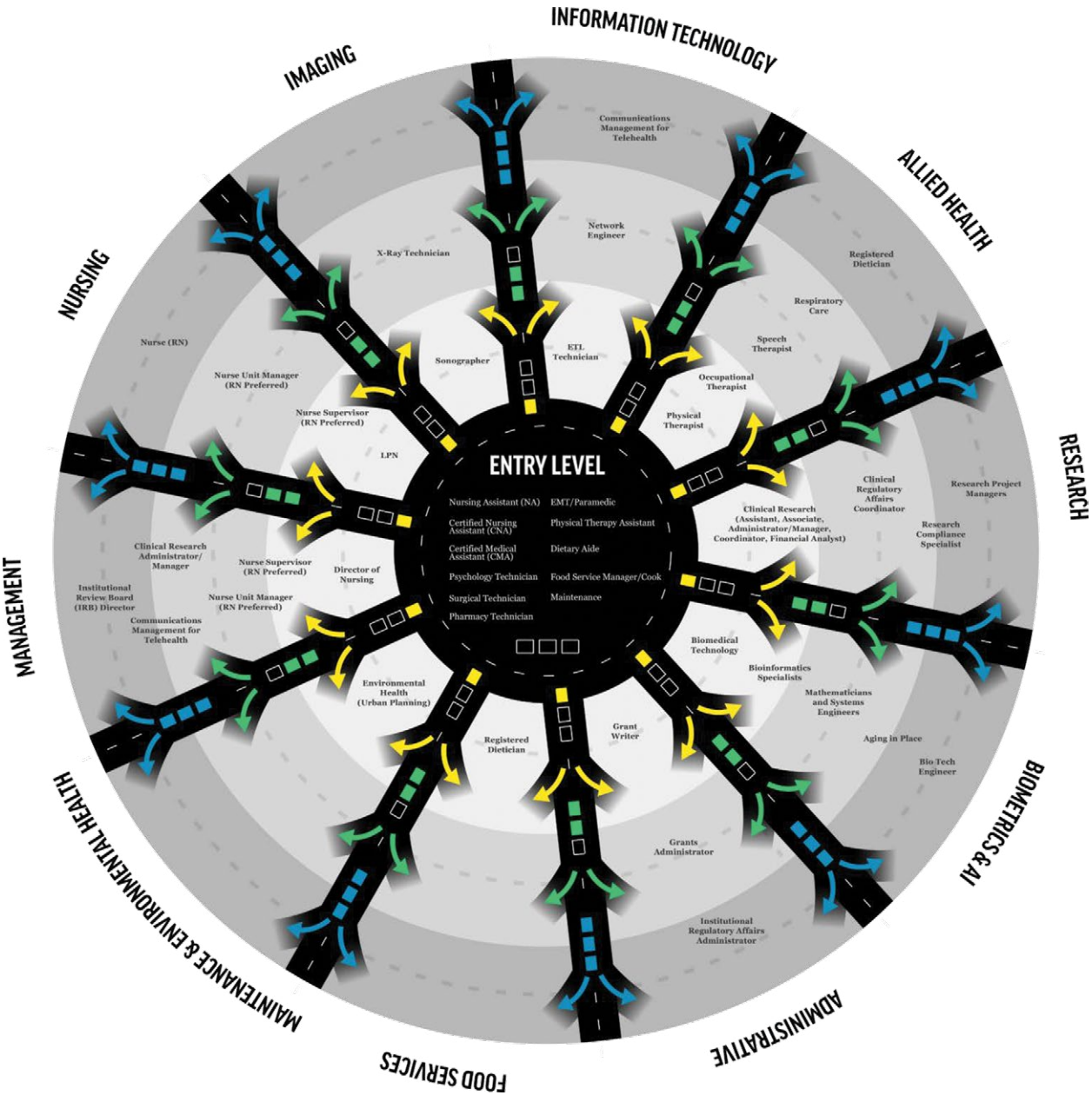
Career Lattices

New River | Mount Rogers Regional Healthcare Career Lattice



Blue Ridge Partnership for Health Science Careers Lattice

NOTE: This career pathway map from the BRPHSC highlights the steps towards Biomedical, Biotechnology, and Life Science careers (listed under Research and Biometrics & AI on the right side).



Transportation & Autonomous Manufacturing Company List

Company
Aeroprobe
AMG Inc.
Austin Electrical Construction, Inc.
Automated Conveyor Systems
BGF
Branch Civil (part of Branch Group)
Ceramic Tubular Products (CTP)
Corning, Inc.
Cowden Technologies
D M T LLC
Dynax America Corp.
Eldor Automotive Powertrain USA
Ess Technologies
First Four Petroleum Group, LLC
Foster Fuels
Foxguard Solutions (Framatome)
Fuji Electric Corp of America
Hanwha Azdel
Inmotion
Kollmorgen/Regal Rexnord
Luna Innovations
MAAG (MAWG) Gala
Mack
MELD
Metalsa Structural Products
Mid-Atlantic Aviation Partnership (MAAP)
Moog
PCM Industrial Services, Inc.
Powells Trucks
RDL Mods
S & S MACHINE, Inc.
Schrader-Pacific

Company
Simplimatic Automation
Sonny Merryman
STS Group
Tenneco, Inc.
Thomson Industries (Regal Rexnord)
TORC Robotics
Total Plastic Solutions, LLC
Trova Commercial Vehicles
Virginia Tech Transportation Institute
Volvo
Wabtec Graham White
Werres Corp. - Raymond
Wing
Wolverine Advanced Materials
Yokohama Tires

Executive Summary:

Transportation & Autonomous Manufacturing Interviews

Overview:

This executive summary provides insights from 12 employer interviews conducted with representatives from within the Transportation Manufacturing and Autonomy sectors. The focus of the interviews was to understand current talent needs, recruitment challenges, and develop potential strategies to better align regional education and training programs with industry demands.

1. Industry Focus and Product Lines

- Companies are involved in the manufacture of transportation and autonomous goods. Their processes heavily rely on scientific knowledge, particularly in engineering and software development.

2. Talent Needs and Critical Occupations

- Across the board, companies identified a demand for skilled workers in roles such as engineers, technicians, and operators, all of which require both technical expertise and experience with specialized equipment. However, the specific skills desired varied, with some companies prioritizing critical scientific thinking, while others placed more emphasis on candidates with manufacturing experience. All emphasized a need for candidates to have developed workplace readiness skills.

3. Recruitment Challenges

- Recruitment remains a challenge, particularly due to local competition for skilled labor and the difficulties in attracting candidates to less urbanized areas. Challenges ranged from competition with other local companies (wages and shift offerings) to a lack of talent with the necessary industrial experience or educational background.

4. Educational Requirements and Skill Gaps

- A strong preference exists for candidates with specialized training or industry experience. While some roles may require at least a bachelor's degree, some companies are more flexible, accepting candidates with associate degrees or high school diplomas if they possess strong soft skills and technical aptitude. Practical experience and career readiness skills are consistently highlighted as key competencies across all companies.

5. Partnerships with Educational Institutions

- The majority of companies engage in partnerships with regional educational institutions to build a pipeline of talent. These collaborations often take the form of internships, capstone projects, and other training opportunities aimed at addressing skill gaps. These partnerships often were the best form of recruitment for companies engaging in these practices.

6. Internal Training and Development

- Most of the companies interviewed invest in internal training programs, including mentorship and on-the-job development. These initiatives help upskill their workforce and offer opportunities for career advancement.

7. Future Talent Needs and Adaptability

- Future talent demands will be shaped by technological advancements and expansion plans; some needs are known now while others are uncertain. Flexibility in adapting to these changes is crucial. A combination of upskilling and programs to develop a pipeline of local talent must be implemented to address these needs.

8. Recommendations for Improvement

- Companies believe that enhancing regional educational programs to better align with industry needs would greatly benefit their recruitment efforts. Suggestions include creating more tailored training. Fostering and building relationships with local educational institutions will lead to achieving this goal.

Conclusion

The interviews highlight both common and distinct challenges in workforce development for the Transportation & Autonomous Manufacturing sectors. Common themes include the need for specialized skills, difficulties in retaining talent, and the value of partnerships with educational institutions. Tailored strategies that leverage regional strengths and improve alignment between education and industry requirements are key to addressing these challenges and fostering a competitive workforce.

Executive Summary:

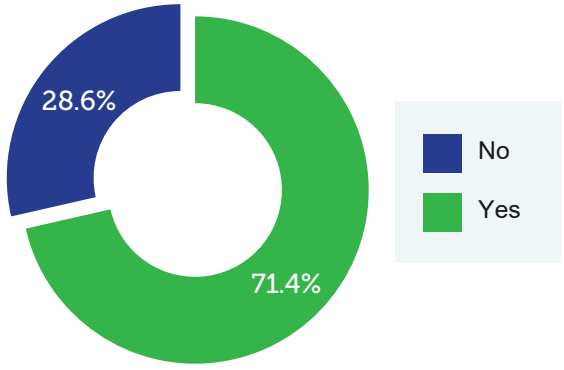
Transportation & Autonomous Manufacturing Surveys

This executive summary provides insights from 7 employer surveys conducted with representatives from within the Transportation & Autonomous Manufacturing sectors. The focus of the surveys was to understand current talent needs, recruitment challenges, and develop potential strategies to better align regional education and training programs with employer needs.

Q5. Please rank how much the following talent attraction and retention challenges are affecting your company:

Statement	Not at all	Slightly	Moderately	Very	Extremely
Multiple job openings now	1	2	2	2	0
	14.29%	28.57%	28.57%	28.57%	0%
Upcoming expansions (2-5 years)	2	0	2	3	0
	28.57%	0%	28.57%	42.86%	0%
Employees leaving or aging out	2	1	2	2	0
	28.57%	14.29%	28.57%	28.57%	0%
Lack of critical skills/ knowledge in talent pool	0	1	2	3	1
	0%	14.29%	28.57%	42.86%	14.29%

Q6. Is your company implementing new technologies to close this gap?



Q8. What occupations are currently highest in demand?

- Maintenance Technicians
- Engineers
- Manufacturing Operators
- Machinists
- Project Managers

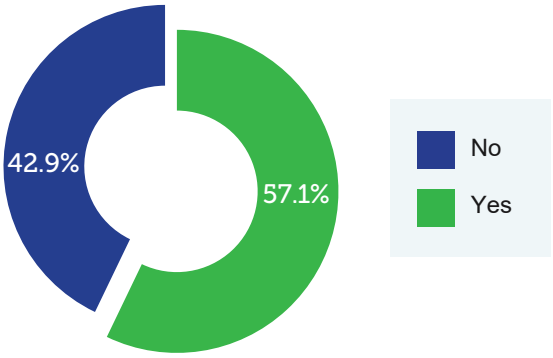
Q9. What occupations will be highest in demand:

- Maintenance Technicians
- Engineers
- Manufacturing Operators
- Machinists
- Project Managers

Q10. For the in-demand occupations, what technical skills will be required?

- Mechanical design
- Electrical, hydraulics, & pneumatics experience
- Machining and metalworking

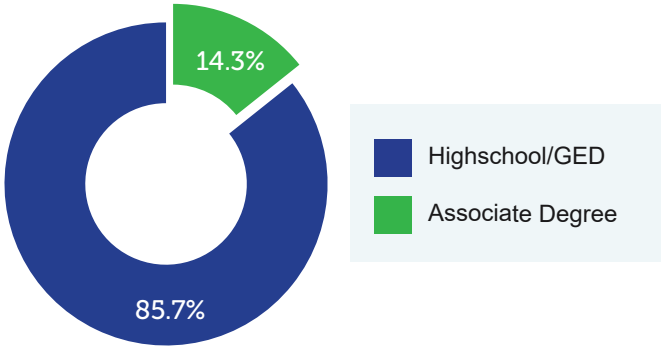
Q11. In the next two to five years, do you anticipate a growing demand for a specific position?



Q12. What is the general title for that position?

- Automation Technicians
- Engineer

Q13. Currently, what is the lowest level of education accepted for entry-level skilled Transportation or Autonomous Manufacturing positions at your company?



Q14. Please select your company's use of teach recruitment method and rank the success of each method for hiring successful candidates.

Statement	Unsuccessful	Somewhat successful	Successful	Very Successful	NOT Utilized
Online Job Boards (e.g., Indeed, Zip Recruiter, Industry Association sites)	1	1	4	1	0
	14.29%	14.29%	57.14%	14.29%	0%
Internship Programs (Interns offered FT positions after completion)	0	1	1	5	0
	0%	14.29%	14.29%	71.43%	0%
(Public) Career Fairs	1	4	1	0	1
	14.29%	57.14%	14.29%	0%	14.29%
(College) Career Fairs	0	3	2	1	1
	0%	42.86%	28.57%	14.29%	14.29%
Through word of mouth	0	4	2	1	0
	0%	57.14%	28.57%	14.29%	0%
Candidates applying directly to company website	2	3	1	1	0
	28.57%	42.86%	14.29%	14.29%	0%

Q15. In what ways do you currently partner with academic institutions?

Statement	Central Virginia CC	Mountain Gateway CC	New River CC	Virginia Western CC	Liberty University
Host interns	0	0	0	1	0
	0%	0%	0%	14.29%	0%
Recruit graduated talent	0	0	1	2	1
	0%	0%	8.33%	16.67%	8.33%
Advise curriculum development	0	0	1	1	0
	0%	0%	25%	25%	0%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	0	0
	0%	0%	0%	0%	0%

Statement (continued)	Randolph College	Roanoke College	Sweet Briar College	University of Lynchburg	Virginia Tech
Host interns	0	1	0	0	5
	0%	14.29%	0%	0%	71.43%
Recruit graduated talent	0	2	0	1	5
	0%	16.67%	0%	8.33%	41.67%
Advise curriculum development	0	1	0	0	1
	0%	25%	0%	0%	25%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	0	0	0	0
	0%	0%	0%	0%	0%

Q16. In what ways would you like to partner with academic institutions?

Statement	Central Virginia CC	Mountain Gateway CC	New River CC	Virginia Western CC	Liberty University
Host interns	2	1	1	3	3
	9.52%	4.76%	4.76%	14.29%	14.29%
Recruit graduated talent	4	2	2	3	3
	13.79%	6.90%	6.90%	10.34%	10.34%
Advise curriculum development	1	1	1	1	0
	25%	25%	25%	25%	0%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	1	0	1	1	0
	20%	0%	20%	20%	0%

Statement (continued)	Randolph College	Roanoke College	Sweet Briar College	University of Lynchburg	Virginia Tech
Host interns	1	2	2	2	4
	4.76%	9.52%	9.52%	9.52%	19.05%
Recruit graduated talent	2	3	3	3	4
	6.90%	10.34%	10.34%	10.34%	13.79%
Advise curriculum development	0	0	0	0	0
	0%	0%	0%	0%	0%
Employee serves as an adjunct instructor	0	0	0	0	0
	0%	0%	0%	0%	0%
Host externships to academic instructors to learn current industry	0	1	0	0	1
	0%	20%	0%	0%	20%

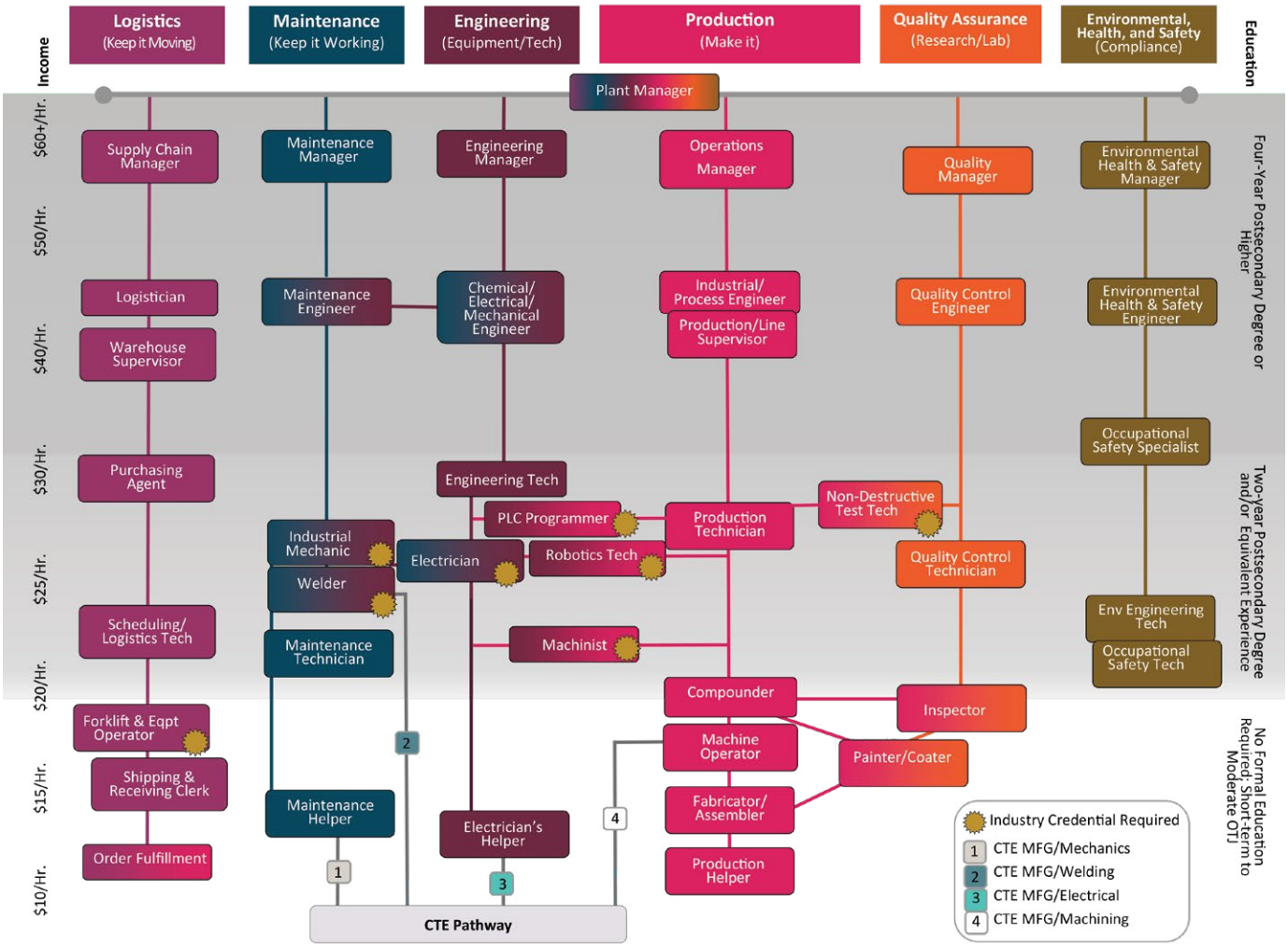
Top In-Demand Occupations for the TAM Industry

This list is projected to remain constant.

SOC Code	Description
17-2000	Engineers
17-2040	Chemical Engineers
17-2070	Electrical and Electronics Engineers
17-2071	Electrical Engineers
17-2140	Mechanical Engineers
17-2190	Miscellaneous Engineers
17-2199	Engineers, All Other
17-3023	Electrical and Electronic Engineering Technologists and Technicians
17-3024	Electro-Mechanical and Mechatronics
17-3029	Engineering Technologists and Technicians, Except Drafters, All other
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
49-3021	Automotive Body and Related Repairers
49-3023	Automotive Service Technicians and Mechanics
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
49-9070	Maintenance and Repair Workers, General
49-9099	Installation, Maintenance, and Repair Workers, All Other
51-2000	Assemblers and Fabricators
51-2031	Engine and Other Machine Assemblers
51-2090	Miscellaneous Assemblers and Fabricators
51-4040	Machinists
51-4121	Welders, Cutters, Solderers, and Brazers
51-9199	Production Workers, All Others

Career Lattices

New River | Mount Rogers Advanced Manufacturing Career Lattice



Roanoke, Virginia

Lynchburg, Virginia

New River Valley, Virginia
Photo credit: Onward New River Valley

CENTER FOR ECONOMIC AND COMMUNITY ENGAGEMENT
VIRGINIA TECH