

VCU-VSU Pharmaceutical Engineering Pathways Project

1. Program Description and Scope of Work

1A. Executive Summary

Co-applicants Virginia Commonwealth University (VCU), located in Richmond, VA, and Virginia State University (VSU), a Historically Black University (HBCU), located in Petersburg, VA, request **\$6,000,000** to implement a Joint Pharmaceutical Engineering Pathways Program (Project). The Project will address the urgent need for pharmaceutical engineers educated and trained in key new technologies needed to re-shore pharmaceutical manufacturing to the U.S in the Richmond/Petersburg Metropolitan Statistical Area (MSA)(Region). It will support the Region's economic development by building and maintaining a diverse workforce needed in the emerging Advanced Pharmaceutical Manufacturing and R&D Cluster (Cluster). The Project will provide upward mobility and long-term financial stability of VSU students in Greater Petersburg, Virginia's most economically distressed area, experiencing a 9.6% unemployment rate.¹ This Project will train over 200 underrepresented students and connect them with employers offering historically high-wage careers. The total project cost will be **\$7,709,348**, and the universities will provide **\$1,709,348** in match funds.

1B. Scope of Work

The Project's purpose is to build the capacity of the VSU School of Engineering and Technology to support the education and training of its diverse students and contribute to the research/manufacturing needs of the Cluster in Petersburg and beyond. It will equip individuals from underserved communities in the Region with a unique skill set to meet the pressing demand of the emerging Cluster. It will do so by systematically linking VCU and VSU programs and by equipping VSU to take an active role in the Cluster. VCU-VSU will implement a five-part educational and research capacity-building initiative. The primary outcome is a pathways program that will 1) provide increased access to education for historically underserved students; 2) provide student support through scholarships and stipends, and 3) provide hands-on experiences to train community college and VSU students in chemistry and chemical engineering – uniquely qualifying them to earn high-paying jobs in the Cluster.

The initiative will leverage the expertise of VCU, a top-ranked pharmaceutical engineering program, to a) augment the curriculum of VSU's existing engineering degree programs, b) offer dual degree options, accelerated pathways to degrees, and a new certificate program, c) provide student stipends and scholarships to remove financial barriers to their education, and d) provide students with hands-on learning experience with employers across the Region to gain the technical skills needed to be competitive in the workforce. VSU plans to start, and implement, a summer recruitment program for high school seniors and recent graduates who may show interest in attending VSU as science, technology, engineering, and mathematics (STEM) majors. Informational sessions for high school students will be made to showcase the department and the opportunities available through this program. Milestones and deliverables of the five-part educational and research capacity-building initiative components are outlined below.

¹ U.S. Bureau of Labor Statistics (2021), Unemployment Rate in Petersburg City, VA.

Dual Degree Track	2-Year/4 year Track	Accelerated Track	Certificate Track	R&D Track
<ul style="list-style-type: none"> Dual Degrees Track will be available to students by academic year 23-24 30 students enrolled in Dual Degrees Track on a rolling basis Total of 60 students will be enrolled in dual degree tracks (Year 1 and 2). 	<ul style="list-style-type: none"> Target and recruit 30 high school graduates to attend VSU with dual enrollment courses with RBC Award 20 partial competitive merit-based scholarships to qualified students. 	<ul style="list-style-type: none"> Recruit and enroll 20 students in Accelerated Track Award 10 VSU students competitive merit-based scholarships to qualified students 80% of graduates hired to be in the pharmaceutical manufacturing industry. 	<ul style="list-style-type: none"> Develop new course offerings for VCU-VSU and create a Pharmaceutical Manufacturing/ Science Certificate program for pharma science or pharma engineering. Regional pharmaceutical manufacturing industry increase of 40 students enrolled in the Certificate Track by Year 2. 	<ul style="list-style-type: none"> 30 trained UG Students on pharmaceutical manufacturing techniques 95% of experienced UG students prepared to enter pharmaceutical manufacturing industry. Enroll and support 20 graduate students (14 MS, 6 PhD.)

2. Regional Industry Assets and Needs

2A. Location and Region

The Project will take place in multiple locations within the MSA, including both campuses, and will rotate students through the [Scale-up Center](#) (see Scale-Up Center Component Application). The City of Petersburg is classified as Poverty Persistent County (PPC) equivalent by EDA.² The City's per capita income is just 69.2% of the national average, and the unemployment rate is 6.4% above the national average.³ The COVID-19 pandemic has worsened the economic situation in Central Virginia. In December 2021, the Region recorded a 3.2% unemployment rate, a 19% increase from pre-pandemic levels in February 2020, and the second-highest unemployment rate for any metro area in Virginia.⁴

Regional Description - The primary service area is Richmond/Petersburg MSA which covers Congressional Districts: VA-004 and VA-007. The Region has 28 Qualified Opportunity Zones (QOZs), or economically distressed communities, across 17 cities: Richmond (51760), Petersburg (51730), Hopewell (51670), and Colonial Heights (51570); and counties: Amelia (51007), Charles City (51036), Chesterfield (51041), Dinwiddie (51053), Goochland (51075), Hanover (51085), Henrico (51087), King and Queen (51097), King William (51101), New Kent (51127), Powhatan (51145), Prince George (51149), and Sussex (51183).

2B. Industry, Employer, and CEDS Alignment

The Project directly aligns with the Region's CEDS equivalent, the GOVirginia Growth and Diversification Plan ([2019](#) & the pending approval [2022](#) update), and the [Crater Planning District Commission CEDS](#) (2021). This Project and the entire Cluster Initiative draws upon and

² FY 2021 Poverty Persistent Counties List.

³ EDA StatsAmerica, using U.S. Census Bureau (ACS 5-year PCMI) data.

⁴ Bureau of Labor Statistics, Unemployment Rates Not Seasonally Adjusted - Richmond, VA MSA.

focuses on the intersection of three industries of strength as top priorities for regional economic development: life sciences, advanced manufacturing, and logistics.⁵ A qualified and diverse workforce is required to meet the goals of the CEDs.

The U.S. federal government has designated onshoring pharmaceutical manufacturing a national priority. Regional pharmaceutical manufacturers, Phlow Corp. AMPAC and Civica were awarded a \$354M contract from Health and Human Services (HHS) Biomedical Advanced Research and Development Authority (BARDA) to produce active pharmaceutical ingredients (APIs) and chemical compounds – with the potential to expand to an additional \$458M. Successfully reshoring pharmaceutical manufacturing will require a competitive workforce with chemistry and chemical engineering skills. The VCU College of Engineering's Pharmaceutical engineering is a new first-of-its-kind program. VCU will graduate its first cohort with this skillset this year and use this opportunity to expand programmatic capabilities to VSU. Without higher graduation rates with this skillset, the Region will not have a sufficient workforce size to meet current and future demand that far exceeds the current graduate levels.

3. Proposed Solution to Barriers

The Project will systematically increase the number of educated and trained pharmaceutical engineers the industry needs by linking students, courses, resources, and programs at VSU with VCU. It will also increase the teaching, support personnel, and research facilities required to educate a larger student cohort. The proposed solution to the barriers will be addressed through the following three goals: **Goal #1:** Prepare an educated, highly skilled workforce from underserved communities in the Region to work in the regional pharmaceutical manufacturing industry by recruiting underrepresented minority students (URMs) students to enroll and complete five Milestones: 1-Dual Degree Track, 2-Year/4-Year Track, 3-Accelerated Track, 4-Certificate Track, and 5-R&D Track. **Goal #2:** Accelerate the University-to-Industry R&D collaboration. **Goal #3:** Establish Research and Development (R&D) facilities and resources to support and sustain education, training, research, and industry collaboration with contributions from VSU Chemistry, VSU Engineering, VCU Chemical Engineering, and local industries.

Feasibility –Infrastructure is already in place at VCU-VSU to support instructional, workforce, and research activities. This Project allows the co-applicants to scale existing efforts that increase the workforce for the Cluster. Robust recruitment efforts will be established to entice students into the VSU/VCU UG/G programs through VSU's Summer Transition Academy.

Accelerating Industry Growth - This Project will accelerate industry growth by providing a steady pipeline of skilled college graduates needed for Cluster growth and competitiveness.

Recovery and Resilience Investment Priority - This Project meets EDA's Recovery and Resiliency Investment Priority by helping the Region recover from long-standing poverty and economic depression that the COVID-19 pandemic has exacerbated. The proposed solution for the Project highlights the EDA's Recovery & Resilience investment priorities to utilize regional assets and resources, including partnering with Industrial Leadership to build economic

⁵ Letter of Support, Grow Capital Jobs Foundation (GOVirginia Region 4)

resilience and long-term recovery to enhance and expand educational opportunities in pharmaceutical manufacturing for economically disadvantaged students. It meets the ***Equity and Workforce*** priorities by ensuring an HBCU design this educational pathway initiative for its diverse student population. It also aligns with the ***Manufacturing and Environmentally Sustainable*** priorities as its programmatic focus is on advanced pharmaceutical manufacturing competencies using green chemistry.

4. Partners and Program Outreach

4A. Partnerships Education Partners

The educational partnership between VCU and VSU is the key to broadening access to Cluster opportunities for underrepresented students and those who do not readily qualify under traditional STEM admissions criteria to undergraduate and graduate (UG/G) degrees.

- **VCU** – A public anchor university located in downtown Richmond with a student body of 29,000 students – 80% undergraduate. VCU will enrich and build upon degrees in Biology, Chemistry, Computer Science, Computer Engineering, Manufacturing Engineering, and Mechanical Engineering Technology to accelerate growth within the Region and industry.
- **VSU** – A public anchor university in the City of Petersburg and HBCU, with 4,500 students (95% undergraduate). VSU will develop a pipeline of URM students for graduate programs at VCU, along with a pathway to better-paying jobs in the pharmaceutical manufacturing industry.

Commonwealth Center for Advanced Manufacturing (CCAM) – Virginia's applied research center provides research and solutions in advanced manufacturing to support the industry, leveraging talent and resources within Virginia's top universities. CCAM will help VSU facilitate university-industry research and experiential learning as an un-funded project partner.

Collaborators & Supporting Organizations – As part of this Project, an Advisory Board will be established within the existing industry Accelerator (Alliance for Building Better Medicines) with regional and statewide stakeholders. Members will include all regional and local Economic Development Organizations (EDOs), the Region's manufacturers, and business and community organizations, including Virginia BIO, Virginia Manufacturers Association, Hopewell Manufacturers Association, CCAM, Advanced Logistics Systems (CCALS), and Cloud Computing (CCCCC), GENedge, Center for Innovative Technologies (CIT), and Virginia Bioscience Health Research Corporation (VBHRC). Similar to CCAM, these organizations will function as un-funded project partners and offer work-study programs, fellowships, hands-on training, and curriculum advancement for students through this Project. Strada Education Network, a national nonprofit social impact organization working to forge clearer and more purposeful pathways to support transitions between education and employment, will also be an un-funded project partner bringing experience from its HBCU Initiative to advise Project leaders on assisting VSU students in overcoming practical barriers to education and employment.

4B. Promoting Diversity, Equity, and Inclusion (DEI)

This Project ensures the Region's HBCU is fully integrated and resourced for full participation in the Cluster and provides generational wealth-building opportunities for its hometown of Petersburg. VCU-VSU will access the Cluster's full-time DEI coordinator hired as part of the Phase 1 BBBRC to maximize student engagement with the initiatives. As a result of this Project,

VSU will increase its capabilities to educate, research in specific areas, and become an equal partner with VCU in training talent and providing research to industry. The Project will help the co-applicants to create complementary roles, as VSU is meaningfully plugged into the Cluster. This Project is an intentional effort to ensure an HBCU has a decision-making role and is fully integrated and resourced for full participation in the Cluster. Aggressive recruitment efforts will be established by VSU to entice students into the VSU/VCU UG/G pathways program, as well as into the dual degree program.

5. Measurable Goals and Impacts

Timeline for all activities: Sept. 2022 to Aug. 2024

Goal #1: To prepare an educated, highly skilled workforce from underserved communities in Richmond/Petersburg to work in the regional pharmaceutical manufacturing industry by recruiting URM students to enroll and complete five Milestones: 1-Dual Degree Track, 2-Year/4-Year Track, 3-Accelerated Track, 4-Certificate Track, and 5-R&D Track.

Objectives	Output	Outcome
Create Dual Degrees Track: VSU-VCU path for VSU UG students to participate in Chemical Engineering program at VCU.	-Dual Degrees Track will be available to students by academic year 23/24. -30 students enrolled in Dual Degrees Track on a rolling basis.	Total of 60 students enrolled in dual-degree tracks (Year 1 and 2)
2-Year/4-Year Track: Richard Bland Junior College (RBC)-VSU-VCU Pipeline path - Junior College to VSU UG in Chemistry/ Mfg. and finish courses at VCU earn Masters in Chemical or Pharma Eng.	-Target and recruit 30 high school graduates to attend VSU with dual enrollment courses with RBC. -Award 20 partial competitive merit-based scholarships to qualified students.	2-Year/4-Year Track graduates 20% more students during the grant period.
Certificate Track: Develop new course offerings for VCU-VSU and create a Pharma Manufacturing/Science Certificate program for pharma science or pharma engineering.	Pharma Manufacturing/Science Certificate program is available with capacity for 60 students annually.	Regional pharma manufacturing industry increase of 40 students enrolled in the Certificate Track by Year 2.
To attract and recruit URM students to have equitable access to enroll in VSU-VCU's chemical and pharmaceutical engineering programs.	50 URM students enrolled in VSU-VCU's chemical and pharmaceutical engineering programs.	Regional pharma mfg. industry increases 60% of URM workforce by Year 2

Goal #2: To accelerate the University-to-Industry experiential collaboration learning.

Objective	Output	Outcome
Scale VCU's Accelerated MS track in Chemical Engineering and prepare students for the transition to the workforce or doctoral	-Recruit and enroll 20 students into the Accelerated Track. -Award 10 VSU students with	- Accelerated Track available to students immediately

program in Pharma R&D and/or Manufacturing.	competitive merit-based scholarships to qualified students.	
Highly trained students transition from university prepared to enter the pharmaceutical manufacturing industry.	80% of graduates hired to be in the pharmaceutical manufacturing industry.	95% of students report they are prepared to enter the industry.
Students receive experiential training with industry partners to ease the transition to the workforce.	40 students participating in experiential training with industry partners.	95% of students report experiential training valuable during their transition to the workforce.

Goal #3: To enhance VSU R&D capabilities specific to the new pharmaceutical engineering technologies to support and sustain education, training, and collaborative research with industry and VCU.

Objective	Output	Outcome
R&D facilities are established and fully resourced with a student engagement continuum to provide increased access and enhanced preparation for a career in pharmaceutical manufacturing.	-30 trained UG students on pharmaceutical manufacturing techniques. -95% of experienced UG students prepared to enter the pharmaceutical manufacturing industry. -Enroll and support 20 graduate students (14 MS, 6 Ph.D.).	Increase engagement of students by 100% by the end of Year 2, preparing them for highly technical pharmaceutical manufacturing.

6. Sustainability Plan –VSU and VCU, anchor institutions of their respective cities, are committed to funding the Project past the 2-year project period. Measurable objectives will be tracked throughout the grant term. Funding for evaluation, conducted by the Wilder School of Government and Public Affairs at VCU, is included in the project budget. VCU has committed to a new Multicultural Engineering Program and a permanent Director position to ensure the Project is continued in the future. In addition, the Project has support from the state through a GO Virginia match of \$80,000 towards Project.

Challenges/Barriers: The two main challenges of this Project are access to academic pathways and financial barriers for students. To overcome these challenges, funding from EDA will provide students with access to education, stipends, and student support to reduce financial barriers to entering the degree and certificate tracks and increase the capacity for a hands-on research experience at VSU.

Operations: Both universities are committed to funding Project operations into the future and beyond the grant term. This funding will enable VCU-VSU to utilize additional lab facilities, including the [Scale-Up Center](#) and the [Innovation Center](#) – other initiatives requesting funds through EDA (See other Component Applications).

Equity: EDA's investment will provide opportunities for students from this HBCU-involved university to meaningfully participate in the Cluster by receiving a variety of credentials.