OUTREACH & INTERNATIONAL AFFAIRS
CENTER FOR ECONOMIC AND COMMUNITY ENGAGEMENT
VIRGINIA TECH

Center for Economic and Community Engagement
400 Stanger St., Suite 109
Blacksburg, VA 24061
https://cece.vt.edu/

Joint meeting of the Center for Economic and Community Engagement Advisory Board and the Virginia Tech Council on Vibrant Virginia
Inn at Virginia Tech
901 Prices Fork Road, Blacksburg
Solitude Conference Room
March 10, 2022, 11:00 AM - 2:00 PM

11:00 AM Welcome and Introductions
- Guru Ghosh, Vice President, Outreach & International Affairs

11:20 AM Director's Report and Board Actions
- John Provo, Executive Director, CECE

12:00 PM *(Working Lunch)*

Virginia Tech and GO Virginia/Panel Discussion
- John Provo, Executive Director, CECE
- Panel- Brett Malone, President, VT Corporate Research Center
  Pam VanDeVord, Associate Dean Research Innovation, VT College of Engineering
  Masoud Agah, Professor, VT Department of Electrical and Computer Engineering

1:00 PM Vibrant Virginia/Panel discussion
- John Provo, Executive Director, CECE
- Scott Tate, Associate Director for Community Innovations, CECE
- Feng Lin, Associate Professor, VT Department of Chemistry
- Mary Fant Donnan, Executive Director, Alleghany Foundation

1:45 PM Open discussion, future goals and objectives
Group

2:00 PM Adjournment

ZOOM
https://virginiatech.zoom.us/j/82092851183?pwd=T1ZMOUs5MXA5U05mYnAvZW0zZG83UT09

Meeting ID: 820 9285 1183
Passcode: 610266

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Speaker Bios

Chief Executive Officer, Virginia Tech Corporate Research Center

Dr. Brett Malone is a triple Hokie is a triple Hokie with 20 years of executive experience in growing engineering, biotech, and software business. Malone learned firsthand what it was like to build a company in Virginia Tech's Blacksburg-based research park, led then by longtime CRC President and CEO Joe Meredith.

As co-founder of Phoenix Integration, a firm that creates software for engineering, Malone helped build a notable company that is still part of the CRC and serving the aerospace industry. Malone has led multiple companies based around the country since graduating from Virginia Tech in biotech, robotics, engineering, and software. He has a broad background working successfully with early stage companies and with related funding sources.

Malone is respected in the regional entrepreneurship community, with engaging ideas on how to best position the CRC to continue its positive impact on the region going forward.

EDUCATION

- Ph.D., Virginia Polytechnic Institute and State University, Aerospace Engineering
- M.S, Virginia Polytechnic Institute and State University, Aerospace Engineering
- B.S., Virginia Polytechnic Institute and State University, Aerospace Engineering

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Pamela VandeVord
Associate Dean, Research and Innovation, Harrison Professor

Dr. VandeVord is the N. Waldo Harrison Professor and the Associate Dean for Research and Innovation in the College of Engineering, where she provides leadership and development of the college's comprehensive research efforts.

Dr. VandeVord is faculty within the Biomedical Engineering and Mechanics Department and is a Research Health Scientist at the Salem VAMC. Her research thrust focuses on complex mechanisms of nervous system injury, with efforts to understand the persistent neurobehavioral and neuropathological

consequences of a traumatic event. For the past 18 years, she has been studying the fundamental questions concerning the mode of blast energy transfer to the brain during traumatic injuries as well as the consequent damage or disruptive mechanisms at the cellular and molecular levels. Her group uses multiscale preclinical models to discover the molecular changes that occur within cells and their environment which lead to dysfunction. She was awarded the 2009 PECASE for her pioneering work in this area. She has received a personal share of over $10.6M in funding from sponsors including the NIH, DOD, VA, and NSF. She has published 86 peer-reviewed manuscripts and three book chapters and is a Fellow of the American Institute of Biological and Medical Engineering and the Biomedical Engineering Society.

EDUCATION
She holds a Ph.D. in Biomedical Engineering from Wayne State University.

Masoud Agah
Virginia Microelectronics Consortium Professor

Masoud Agah is a professor of electrical and computer engineering in the College of Engineering at Virginia Tech.

Agah joined the Bradley Department of Electrical and Computer Engineering in 2005 as an assistant professor and received promotion to professor earlier this year. He has been a member of the core faculty in the School of Biomedical Engineering and Sciences since 2012 and a faculty member in the translational biology, medicine, and health program since 2013.

Agah has become a world leader in microelectromechanical systems and biosensors having established a dynamic research group that actively publishes in many top research journals, including several Institute of Electrical and Electronics Engineers' Society journals. He has published more than 60 journal articles and 100 conference publications, and has more than 1,700 citations.

With his colleagues, he has been awarded one U.S. patent in 2005 and has six patents pending at Virginia Tech. During his 10 years at Virginia Tech, Agah has secured at least 18 research projects totaling more than $5.6 million and a personal share of at least $3 million.
In the classroom, Agah has created a new course, Electrical and Computer Engineering 5210: Microelectromechanical Systems from Fabrication to Application, which is very well received by students.

Agah received his bachelor's degree and a master's degree from Sharif University of Technology, Tehran, Iran, and a Ph.D. from the University of Michigan.

EDUCATION
Ph.D., University of Michigan, 2005
M.Sc., Sharif University of Technology, 1998

B.Sc., Sharif University of Technology, 1996

Feng Lin
Leo and Melva Harris Faculty Fellow
Associate Professor

Lin joined the Virginia Tech Chemistry community in 2016. He earned a bachelor's degree in materials and engineering from Tianjin University in China in 2009 and a Ph.D. degree in materials science from Colorado School of Mines in 2012. From there, Lin worked as a postdoctoral researcher at Lawrence Berkeley National Laboratory and as a senior member of technical staff at a battery company, both in the Bay Area of California.

Lin's research programs have been funded by NSF, DOE, the U.S. Air Force, the U.S. Department of Agriculture, the American Chemical Society, Oak Ridge Associated Universities, private foundations, and Virginia Tech's Institute for Critical Technology and Applied Science, and the College of Science's Lay Nam Chang Dean's Discovery Fund.

EDUCATION
B.S., Materials Science & Engineering, Tianjin University (2009)
Ph.D., Materials Science, Colorado School of Mines (2012)
Graduate Researcher, National Renewable Energy Laboratory (2010-2012)
Postdoctoral Fellow, Lawrence Berkeley National Lab (2013-2015)

Mary Fant Donnan, Executive Director, Alleghany Foundation

With a background in community economic development, philanthropy, and education, Mary Fant Donnan became the Executive Director of The Alleghany Foundation in 2011. Mary holds a Bachelor of Arts in Music from Davidson College and a Masters degree in Environmental Studies from the University of Adelaide in South Australia. She and her husband, Bob, a sports photographer based in the Alleghany Highlands, have three children whose school, sports, and musical activities keep them hopping. While family time certainly comes first, Mary admits to looking for opportunities to indulge in her own gardening or cooking pursuits whenever she can.

CENTER FOR ECONOMIC
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Director's Report
Spring 2023

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VIRGINIA TECH

Our Charge

- Increasing the university's impact
- Elevating the *Ut Prosim* difference
- Maintaining a transdisciplinary focus
- Addressing the urban-rural divide

Mission

We advance economic and community prosperity through delivery of applied research, engaged partnerships, and targeted university expertise.

We value:

- Connecting communities
- Collaboration and teamwork
- Continuous learning
- Community-tailored research
- Promoting equitable development

PORTFOLIO UPDATES

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Current Highlights

National and Multi-state

- Appalshop Radio Feasibility Analysis (Appalshop)
- Economic Impact of VR in Unmanned Systems (National Science Foundation) with Virginia Tech Aerospace and Ocean Engineering
- Market analysis for steam treatment of export logs (US Department of Agriculture) with Virginia Tech Sustainable Biomaterials
- Precision Ag for Veg, Phase One Convergence Accelerator (National Science Foundation) with Virginia Tech Applied Research Corporation, and School of Plant and Environmental Sciences
- University Center Cohort Program (US Economic Development Administration) with University Economic Development Association

State and Multi-regional

- Crushed Rock Economic Impact Analysis (Virginia Aggregates Association) with Virginia Tech Mines, Minerals, and Energy
- Data Center Incentives Economic Impact (Virginia Economic Development Partnership) with George Mason University and Old Dominion University
- GO Virginia Region 2, Support Organization (VA Department of Housing and Community Development)
- Regional Internship Collaborative (State Council of Higher Education for Virginia)
- Small business health and organizational wellbeing workshop (USDA-National Institute of Food and Agriculture) with Virginia Tech's Agricultural and Applied Economics Department
- University Center Program (US Economic Development Administration) with Virginia State University

USDA

VEDP Virginia Economic Development Partnership

GO VIRGINIA Growth & Opportunity for All Virginia — Region 2

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Current Highlights

Greater Washington

- Entrepreneurship Initiatives (Virginia Tech Innovation Campus)
- Industry collaboration initiatives (Space@VT)
- Major design experience program (Virginia Tech Electrical and Computer Engineering)
- STEM internships development (Urban Alliance)

Hampton Roads and Richmond Region

- Economic Impact Analysis (VA Seafood Agricultural Research and Extension Center)
- Hanover County Industrial Analysis (Hanover County)
- Promoting Careers in Aquaculture (GO Virginia Region 6) with Rappahannock Community College and VASAREC
- 150 Year Plan Data Dashboard (Black BRAND) Computational Modeling and Data Analytics Capstone

Space@VT

Virginia Tech Innovation Campus

VA Seafood Agricultural Research and Extension Center

Hanover County Courthouse

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Current Highlights

New River Valley and Roanoke Valley-Alleghany Highlands

- Alleghany Lodging and Market Study (Alleghany Community Foundation)
- Highland Inn Economic Impact Analysis (Highland County Economic Development Authority)
- New River Valley Data Template (Onward NRV)
- Quarterly Workforce Trends Report (New River Mountain Mt Rogers Workforce Investment Board)
- Verge Strategic Services (Verge Technology Alliance)
- Virginia Tech Economic Contributions Study (Virginia Tech Foundation)

Highland Inn in Monterey, Virginia

CECE graduate assistants conduct interview for West Piedmont Agritourism Impact and Marketing project.

Southwest Virginia and Southside

- Bristol Recovery Ecosystem Needs Assessment (YMCA Bristol)
- Controlled Environment Agriculture Planning (GO Virginia Region 3) with IALR and Virginia Tech School of Plant and Environmental Sciences
- Lawrenceville Revitalization (St. Paul's College 4 Life) with Virginia Tech's Institute for Policy and Governance
- Star Theater Feasibility Study (Town of Stuart)
- West Piedmont Agritourism Impact and Marketing (West Piedmont Planning District Commission)

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Pipeline – Under Review

- Arrowbrook Urban Extension Center (Fairfax), Feasibility study : Launders Charitable Trust, with VCE
- Dock2Door: NSF Regional Engines Program, with VTTI and others
- Community-based Research and Outreach for Farmworker Wellness in Virginia: VCE, with CALS-CFSTC
- Egypt Partners for Educational Progress: USAID, with CIRED and others
- Demonstration Site for Clean Energy Transition to Green Hydrogen – HRH2: GO Virginia Region 5, with VTCRC
- Industry-led Innovation Engine for Production and Mass Deployment of High Performance Affordable Buildings Using Industrialized Offsite Construction in Appalachia: NSF Regional Engines Program, with COE

U.S. Agency For International Development Seal

Arrowbrook Urban Extension Center (Fairfax)

ADMINISTRATIVE AND PERSONNEL UPDATES

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Faculty and Staff Updates

Emma Brown
Program Assistant, Region2 Internship Collaborative

Scott Tate
Associate Director for Community Innovation

Elli Travis
Senior Economic Development Specialist

Quina Weber-Shirk
Program Manager, GO Virginia and Region 2 Internship Collaborative

Joanie Willett
Fulbright Scholar; Senior Lecturer at University of Exeter

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New Board Members

Sara Dunnigan
Deputy Director, Virginia Department of Housing and Community Development

Michael Gutter
Director, Virginia Cooperative Extension

Lauren Stuhldreher
Economic Development Representative-Virginia, US Economic Development Administration

Christina Winn
Executive Director, Prince William County Economic Development; President, Virginia Economic Developers Association

OTHER BUSINESS

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Other business

- Minutes
- Open discussion

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JOHN PROVO
jprovo@vt.edu
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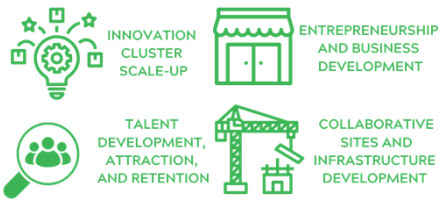
GO VIRGINIA

VIRGINIA INITIATIVE FOR GROWTH & OPPORTUNITY IN EACH REGION

GO Virginia Purpose Statement

"Create more higher paying jobs through incentivized collaboration, primarily through out-of-state revenue, which diversifies and strengthens the economy in every region"

Core Strategies to Grow Economic Opportunity:




Projects led by Virginia Tech in the NRV and beyond
Region 2 (NRV, Roanoke, Lynchburg):
Blockchain Ecosystem Catalyst: Computer Science
cs/root: Computer Science
Destination For Talent Internship Program: Learning Systems Innovation
Public Health Readiness Evaluation Mobile App: Institute for Critical Technologies and Applied Sciences
Workforce Training and Regional Capacity for Rapid High Throughput COVID-19 Testing: Vice President for Health Sciences and Technology
Helping Local Employers Prepare the Existing and Future Workforce for Industry 4.0: Industrial and Systems Engineering Learning Factory, Roanoke Center
Industry 4.0 for the ACE Workforce: College of Engineering, Industrial and Systems Engineering (ISE) Learning Factory, Roanoke Center
Flex Lab Assessment and JBLJ Labs Partnership: Corporate Research Center
Project Eagle +: Corporate Research Center
Region 1 (Southwest Virginia):
SWVA Agricultural Opportunities Project Manager: Virginia Cooperative Extension
Coal to Graphene Study: Institute for Critical Technologies and Applied Sciences
Region 3 (Southside):
Controlled Environment Agriculture Roadmap: School of Plant and Environmental Sciences, Center for Economic and Community Engagement
Region 5 (Hampton Roads):
H2H2 (Hydrogen Hub): Corporate Research Center, Center for Economic and Community Engagement, College of Engineering
Region 6 (Fredericksburg, Middle Peninsula, Northern Neck):
Promoting Careers in Aquaculture: Virginia Seafood Agricultural Research and Extension Center, Center for Economic and Community Engagement
Region 7 (Northern Virginia):
Virginia Nanotechnology Network Initiative: Electrical and Computer Engineering, Center for Economic and Community Engagement

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Vibrant Virginia:

Vibrant places in every part of the Commonwealth

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Vibrant Virginia – Overall Initial Goals:

- **Enhancing the impact of Virginia Tech, and higher education across the Commonwealth, in advancing community prosperity**
- **Helping address economic, social, health, and environmental issues in Virginia communities**
- **Building connections across divides, especially urban and rural Virginia**

Vibrant Virginia 1.0 (2018-2020)

- **State policy report**
- **External community connections**
- **Campus community of practice**
- **Book project**
- **Beyond Boundaries Vibrant VA project goals**
- **Project seed funding**

Vibrant Virginia 1.0 Summary report:
https://cece.vt.edu/content/dam/cece_vt_edu/vibrantvirginiafinalreport.pdf

One time support from Provost, OIA,VCE, College Access Collaborative, ISCE and SPIA

Vibrant Virginia 2.0 (2020-2022)

- **Virtual conference series**
  https://cece.vt.edu/VibrantVirginia/VVConferenceSeries.html
- **VT Council on Vibrant Virginia**
  https://cece.vt.edu/VibrantVirginia/VTCouncilonVibrant.html
- **Vibrant Virginia Impact Fund**
  https://cece.vt.edu/VibrantVirginia/VTCouncilonVibrant/VVCFP.html.html

Co-Investment from OIA,VCE, College Access Collaborative, ICAT, ICTAS, ISCE, LSIE/4VA

Vibrant Virginia 3.0 (2023-2026)

- **VT Council on Vibrant Virginia**
  https://cece.vt.edu/VibrantVirginia/VTCouncilonVibrant.html
- **New activities:**
  - **Convenings; Collaboratives; Community of Practice (and VV Faculty Affiliates)**

Proposed: Co-Investment from OIA,VCE, College Access Collaborative, ICAT, ICTAS, ISCE, FLSI, LSIE/4VA matched by a university budget investment and philanthropic support

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Our work is focused on advancing the University's mission and Beyond Boundaries strategies:

- " Inspired by our land-grant identity and guided by our motto, Ut Prosim (That I May Serve), Virginia Tech is an inclusive community of knowledge, discovery, and creativity dedicated to improving the quality of life and the human condition within the Commonwealth of Virginia and throughout the world."
- "BEYOND BOUNDARIES identified three guiding concepts to transform Virginia Tech into the university of the future:

  -VT-shaped Discovery (purpose-driven discovery),

  -Communities of Discovery (campus, regional, and global engagement hubs), and

  -Nexus of Discovery (transdisciplinary discovery)."

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The need: the divides in VA continue to grow

- The pandemic exacerbated social disconnectedness and diseases of despair have also risen sharply in the state and nation.
- Political polarization and declines in civic trust and social capital have been much discussed and increasingly apparent.
- Virginia leads the nation in the extent of the disparity between our more affluent and less affluent counties.
- While Vibrant Virginia(VV) has become a significant VT initiative and a part of the University's Beyond Boundaries Strategic Plan, it still holds greater potential for:
  - -VT-embeddedness, resources and sustainability;
  - -community and place-specific impact and deeper engagement;
  - ***-state-wide visibility*** and partnership;
  - -and ***global and national distinctiveness.***

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Vision:

Vibrant places in every part of the Commonwealth

Mission:

We address the crises and challenges of disconnectedness, divisiveness and disparity by encouraging vibrant places that are more connected, cohesive, and caring.

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Our focus:

To address the inter-related challenges of social disconnectedness, civic divisiveness, and economic disparity, we conduct three primary areas of activity:

- **Convenings**
- **Collaboratives**
- **Community of Practice**

And support and engage Vibrant Virginia Faculty Affiliates.

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Vibrant Virginia Convenings:

One-time gatherings in a community to explore concerns and community responses related to disconnectedness, disparity, or divisiveness; and/or to explore the launch of a Collaborative Start-up (next slides).

The Virginia Tech Center for Economic and Community Engagement (VTCECE) helps plan and facilitate convenings, and is developing a Convenings guide for communities or faculty who would like to plan and facilitate sessions on their own.

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Vibrant Virginia Collaboratives:

Collaboratives focus in depth on one aspect or issue related to disconnectedness, divisiveness, or disparity in a specific Virginia place.

There are of two types:

- Collaborative Start-Ups
- Collaborative Scale-Ups

A Collaborative Start-Up is a short term (1 year or less) exploratory process to establish a new collaborative.

Collaborative Scale-Ups may be an existing community initiative or social innovation project that wants to grow or expand.

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Vibrant Virginia Community of Practice:

Faculty, graduate students, and community partners involved in convenings and collaboratives will be invited to join the Vibrant Virginia community of practice. Non-VT scholars or social innovators with related interests will also be identified and invited.

Activities may include networking and sharing events; a biennial symposium; workshop and learning opportunities; promising practices collections and toolkits; stories of those social innovators working on the frontlines to advance a more vibrant Virginia; web-based resources and a monthly newsletter; or a second VV book project, perhaps focused on place-based social innovation.

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Vibrant Virginia Faculty Affiliates

Faculty (and potentially graduate students) whose interests align with VV. May become active participants in Community of Practice and become engaged in one or more Convenings, Collaboratives, or opportunities for scholarship and networking.

VTCECE will work with faculty affiliates and community partners in support of funding, TA, etc related to VV.

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Status:

- Exploratory conversations with community partners (entities that function as gateway organizations not gatekeepers) per hosting a convening or conversation per a collaborative start-up in next 3-6 months:

  (Alleghany-Covington; Martinsville-Henry; Bristol and Washington County; Hopewell; NW and/or SE Roanoke; others TBD).

- Proof of concept/exploratory funding from OIA.
- Community of Practice resources being compiled, as well as list of interested faculty (Opportunity for VV Faculty Affiliates)

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Questions/Possible Challenges:

- Initiative assumes value of deeper place-based engagement around specific areas of need/challenge; and that addressing divides, disparity, and disconnectedness is a critical and compelling mission.
- University funding for this sustained work has not yet been secured, beyond initial OIA seed amount. VT CECE would need to be catalyst and glue for this initiative, yet may require more support to dedicate staff and faculty resources to this work
- Success depends on some level of University support for sustained activities, AND ability of place-based collaboratives to generate funding or support from partner regions, as well as from other state, federal, and foundation sources.
- Community support may depend on confidence level or trust-building between VT and partners, to demonstrate commitment in a place (VT role in many VA places has been funding-driven, short-term, or sporadic in nature; this is a shift to place and issue-driven, with funding to be generated through the sustained engagement over time).

FOR MORE INFORMATION

SCOTT TATE OR JOHN PROVO

atate1@vt.edu jprovo@vt.edu

www.cece.vt.edu

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PI: Feng Lin, Associate Professor, VT Chemistry; fenglin@vt.edu; 540-231-4067

Final Report

PI: Feng Lin, Co-PIs: Wencai Zhang, Chixia Tian

An Integrated Approach to Maximizing the Value of Coal with Low Carbon Footprint: Developing Advanced Battery Materials and Recovering Critical Elements

1. Project background, description, and key partners

This project, bringing together three VT professors, two regional coal processing companies, and one 4-VA partner, aims to develop comprehensive uses of coal through an integrated approach: recovery of critical elements from the mineral matter of coal, and preparation of advanced carbon materials from the organic matter of coal for lithium and sodium ion batteries (**Figure 1**). Run-of-mine coals and coal preparation rejects will be collected and separated into high-ash content (high-mineral matter) fractions and low-ash content (high-organic matter) fractions, which will be subjected to critical elements recovery and battery materials development, respectively. Moreover, carbonization products of the low-ash content fractions prepared for battery materials will also be subjected to critical elements recovery.

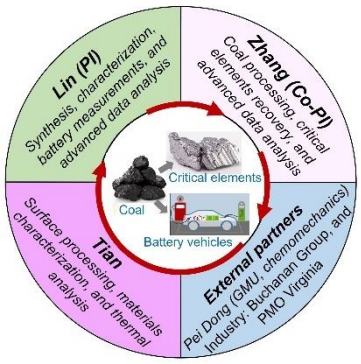

Figure 1. Overview of the research team and contributions of each Co-PI to the project.

Our approach of using coal as a raw material for critical elements recovery and rechargeable battery materials preparation will bring the following revolutionary advances to coal, critical element, and battery industries: (1) We will take advantage of highly tunable, abundant, and cost-effective raw materials to address the need of the highly demanding energy storage field; (2) We will contribute to help the establishment of domestic supply chains of critical elements by recovering critical elements from coal; (3) Using coal as a source of critical elements and coal-derived carbon materials as battery anodes can significantly mitigate the environmental challenges of coal utilization and reduce the dependence of imported critical elements and battery materials; (4) The beneficial uses of coal in our project will promote the prosperity of coal industry in Virginia, thus leading to more employment opportunities and contributing more GDP; (5) Our approach of critical elements recovery is distinct from existing approaches by using microwave-assisted calcination technology, which is more energy efficient than conventional calcination.

Figure 2. Pictures showing the coal refuse pond (left) and sample collection by the team (right).

2. Results, Key Findings, and Accomplishments

2.1. Sample collection, preparation, and separation

Three buckets of coal refuse sample were collected from a coal refuse pond located in eastern Virginia (**Figure 2**). The coal refuse pond is a property of PMO Virginia, an industrial partner in

our team. The coal refuse was generated during coal preparation process of run-of-mine coals. TGA analysis of the sample per the ASTM D3172-13 standard showed that the coal refuse had an ash content of around 39%. This ash content indicated that the material contained 61% of organic matter and 39% of inorganic matter. A flotation release test was performed on the sample to evaluate the viability of separating the organic and inorganic matter existing in the material. Several products were generated from the test, which were subjected to TGA analysis to measure ash content. In addition, rare earth elements (REEs) contents of the products were also measured.

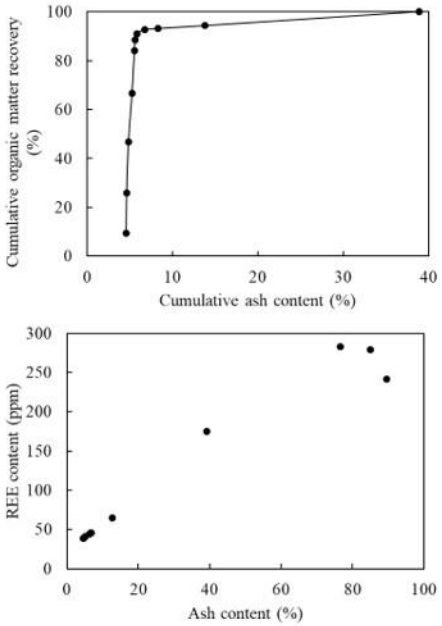

Figure 3. Flotation release test results.

Results of the flotation release test are presented in **Figure 3**. The cumulative ash content corresponding to 90% cumulative organic matter recovery was around 6%. In other words, a product with 6% ash content can be produced from the material while recovering 90% of the organic matter. This phenomenon indicated that the organic and inorganic matter existing in the coal refuse can be efficiently separated using froth flotation. The REE content gradually increased with the increase in ash content, suggesting that the high ash content, low organic matter content fractions in the material contained more REEs than the low ash content, high organic matter content fractions. Our team proposed the concept of using the high ash content fractions for REE recovery while the high organic matter content fractions for battery materials preparation. The flotation release test results confirmed that this concept is viable since the organic and inorganic matter can be separated, and the inorganic matter contained more REEs than the organic matter.

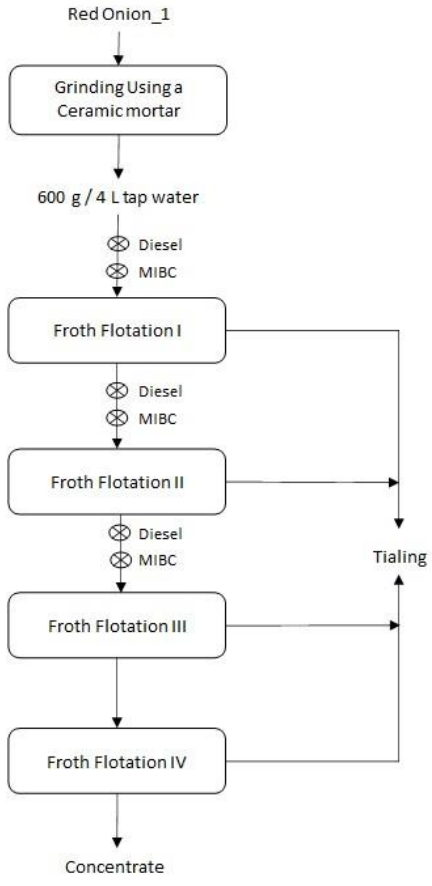

Figure 4. Four-stage of the flotation release test.

Based on the results obtained from the flotation release test, a four-stage flotation test was conducted on 600 g coal refuse to prepare the organic matter for battery material preparation (**Figure 4**). The overall flotation test flowsheet, including four stages of cleaning and separation. The first three stages were conducted by adding diesel and MIBC as collector and frother, respectively. Flotation was continued in each of the first three stages until all the floatable material was recovered. The repeated stages resulted in the elimination of hydraulically entrained materials. For Stage IV, no collector or frother was added while collecting several

froth products by incrementally increasing the rotation speed and airflow rate. After the flotation test, an organic sample with 3.9% ash content was produced. This organic product was served as the raw sample for battery material preparation.

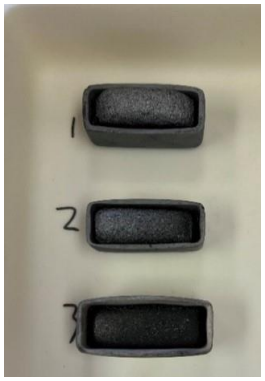

Figure 5. Samples after 800 ºC carbonization.

For each batch of calcination, 6 g of the organic material was divided into 3 alumina crucibles (approximately 2 g per crucible), which were then placed into the tube furnace. The furnace temperature was elevated from room temperature to pre-determined temperatures (i.e., 800 °C, 900 °C, 1000 °C, 1100 °C, 1200 °C, and 1300 °C) under constant nitrogen flow, and the temperature ramping rate was set at 5 °C min^{-1}. After 2 hours of carbonization at the target temperatures, the furnace was naturally cooled to room temperature. Carbonized materials in the crucibles were collected and ground as feedstocks for battery material preparation. The appearance of 800 ºC carbonized samples is presented in **Figure 5**.

2.2. Battery performance

We assembled coin cells and performed battery tests using galvanostatic cycling. Through these measurements, we gained insights into the relationship between processing conditions and battery performance. Specific performance metrics of the full-cell study include: (1) specific discharge capacity in the formation cycle at the C/10 charging/discharging rate, (2) specific discharge capacity in the first cycle at C/10 charging and C/3 discharging rates, (3) capacity retention after 50 cycles at C/10 charging and C/3 discharging rates. In this report period, the team has focused on half cells that use Li metal or Na metal as the counter electrode and coal-derived carbon as the working electrode.

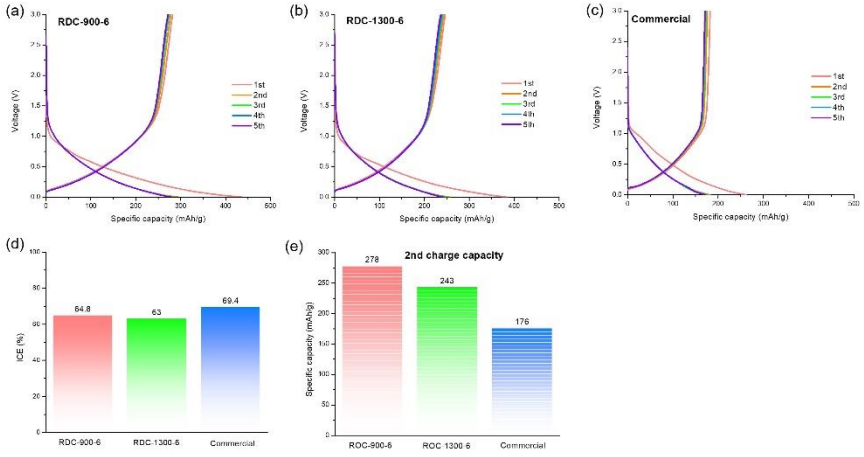

Figure 6. Battery testing results in 1M $LiPF_6$ EC/DMC (volume 1:1) electrolyte. Cycling condition: 0.1 A/g, 0.001-3V. Mass loading: 3.1-3.6 mg/cm^2 for coal-derived carbon, 2.4-2.9 mg/cm^2 for commercial hard carbon.

The composite working electrodes were prepared by spreading the slurry (N-Methyl-2-pyrrolidone as the solvent) with coal-derived carbon materials (80 wt.%), acetylene carbon (10 wt.%) and PVdF (10 wt.%) as the binder and casting them on copper foils. The electrodes were then dried overnight at 120°C in a vacuum oven and transferred into an Ar filled glove box for future use. CR2032 coin cells (half cells) were assembled in an Ar-filled glovebox (O_2<0.5 ppm, H_2O<0.5 ppm) using the composite electrode, lithium foil or sodium foil as the counter, and glass fiber as the separator. All coin cells were cycled at 23 °C. **Figure 6** shows

the Li ion battery testing results. It is found that the capacity of coal-derived carbon is better than commercial carbon materials. The sample carbonized at 900 °C showed the best capacity.

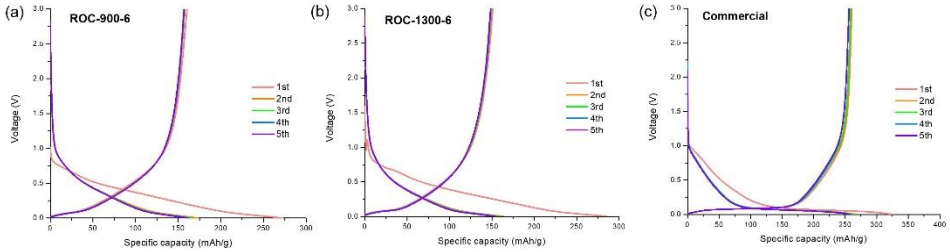

Figure 7. Battery testing results in Electrolytes: 1M $NaPF_6$ diglyme, GF-D as separator, flooded electrolyte, and Na metal foil as the counter electrode. Cycling condition: 0.1 A/g, 0.001-3V.

The team also evaluate the performance in Na ion batteries (**Figure 7**). Only the slope capacity can be observed for coal-derived hard carbon, which means the capacity here is mostly from adsorption. There is insignificant dead pore filling and Na intercalation between graphene layers.

Combining the data for Li and Na batteries, we can preliminarily conclude that coal-derived hard carbon can be a high-capacity anode for Li batteries at this point. However, we expect the materials can be further improved for use in Na batteries by additional post processing, such as mechanical milling.

2.3. Preliminary data for federal funding applications

The team has made good use of the preliminary data generated in this project for federal funding applications. The coal-derived carbon anode technology will make use of the cheapest precursor (coal and coal refuse after critical element extraction) and require minimal post-processing to have performance superior to competing anodes (i.e., lithium-titanium-oxide (LTO), graphite, and Li) under fast-charging and low-temperature conditions. Producing advanced coal-derived anodes can also resolve the environmental issues of coal waste and reshape the coal industry that contributes substantially to the US economy. Based on these advantages, PI Lin incorporated coal-derived anode material as a component to his fast-charging battery cell proposed to DOE's ARPA-E program. The team received $2.945 federal funding to further develop the technology.

3. Barriers

The key barrier is the complex chemical and structural properties of coal. When coal is formed in Nature, it can have many different elements and organic contents. The team has started to develop a standard operating procedure to make the process more reproducible and allow different types of coal to be processed and used in batteries.

4. Conclusion

In summary, the team has made substantial progress towards our project goals. Coal-derived carbon materials are promising for battery applications. The team will continue exploring the use of coal for renewable energy applications and identify potential paths towards commercialization.

Immediate Impacts, Emergent Barriers, and Creative Strategies of preK-12 School-Industry Partnerships during COVID-19: Vibrant Virginia FInal Report

Project Background and Description

Students from rural communities face a number of challenges related to educational access and attainment (Ardoin, 2018) and lower rates of rural students pursuing post-secondary education in particular may exacerbate existing regional employment and income disparities and at the same time represent a key loss of potential talent in fields seeking to broaden participation from marginalized populations (e.g., STEM careers). Partnerships between teachers and regional industry (e.g., sustained outreach or engagement, formalized apprenticeship, mentorship, or internship programs) are a promising approach to broadening participation in STEM careers. Partnerships with industry can inspire students to imagine and scaffold new futures, provide funding and guidance for authentic learning opportunities, and connect students to industry mentors. Involving industry professionals in STEM classrooms increases students participation in out-of-school-time STEM programming, improves knowledge of the engineering-design process, and fosters an enjoyable collaborative learning environment for students, teachers, and professionals (Rogers & Cejka, 2006).

Unfortunately, many of these partnership elements integral to high quality STEM programs have been upended by the COVID-19 pandemic. Upon emerging from the statewide school shutdown of Spring 2020, only 42% of schools in Southwest Virginia offered at least partial in-person instruction in the Fall of 2020 (Virginia Department of Education, 2021). Even as traditional instruction recovered in 2021, CDC guidance continued to limit nonessential visitors in schools, school districts reduced instructional time, and industry partners downsized their workforce and reduced volunteerism. (Virginia Department of Education, 2021; BLS, 2021). The disruptions of COVID-19 put both the success and sustainability of school-industry partnerships at risk. Understanding how partnerships dissolved or creatively endured through the pandemic may provide unique insights by characterizing current challenges as well as celebrating successes for how partnerships cansupport Southwest Virginia's economic and social vitality.

The research purpose of this project was to inventory the disruptive impacts of COVID-19 on the region's successful STEM focused school-industry partnerships, categorize opportunities and barriers, and to share strategies to advance this work focused on improving educational and career outcomes of rural youth. Parallel to this research effort, the project formally partners with the New River Valley Regional Commission to leverage their existing partnerships between school systems, regional industry, and other partners regularly engaged in youth education and career development to build further capacity for diverse, sustainable, and fruitful school-industry partnerships throughout Southwest Virginia.

Accomplishments

- Conducted semi-structured interviews with 19 regional stakeholders including teachers, counselors, STEM coordinators, internship coordinators, and higher education liaisons.
- Produced a journal article entitled "Resiliency Through Partnerships: Prioritizing STEM Workforce Pathways Amid Macro Challenges" that has been accepted for publication with revision in *School Science and Mathematics* in the special issue on "Supporting and Building More Equitable PK12 Pathway to STEM Skilled Technical Careers"
- Hosted community meeting in collaboration with the New River Valley Regional Commission focusing on school superintendents, career and technical education administrators, and other interested partners to discuss the results of our interviews and youth education and workforce outcomes in our region
- Followed up on questions raised in the community meeting by sending out a research report produced on engineering going rates by geography in Virginia and by meeting with Virginia Department of Education stakeholders to discuss data gaps with rural youth education and workforce outcomes

Barriers

A long-term aspirational capacity-building goal from this project was to develop data sharing agreements with NRVRC and school systems within the region in order to link academic and career data and implement more data-informed program and/or policy-level changes in our communities. This goal relied on two corollaries; sources containing comprehensive data on both academic and career outcomes of regional youth are publicly available and regional stakeholders have capacity to meaningfully engage with such data.

While the team maintains access to restricted state-level data included in the Virginia Longitudinal Data System to explore secondary and postsecondary educational data, we have struggled to find a comprehensive source of data for regional graduates directly entering the workforce. Understanding this straight-to-work pathway is integral to aligning educational opportunities with industry expectations. In talking with regional and state stakeholders (including the Virginia Office of Education Economics), it has become clear that there is great interest to engage with these issues and data but that unfortunately the needed data linkage simply does not exist. We will work to formally document this gap as it is particularly important that communities can understand not post-secondary enrollments of their youth but also information about straight to work pathways and/or community college to work pathways.

Results/Key Findings

Our article "Resiliency Through Partnerships: Prioritizing STEM Workforce Pathways Amid Macro Challenges" highlighted two key findings: successful partners maintained network connections through adaptive interactions and actors within the network served as brokers to leverage their connections and expand partnerships in the face of adversity. Additionally this research led to the following recommendations based on our work and the literature that actors within STEM networks (e.g., school leaders, CTE teachers, community college career coaches, school-industry intermediary partners) can try to build momentum by:

- Identifying novel opportunities to organize stakeholders. Convening parties towards a common goal, such as a funding opportunity, provides an excellent foundation for developing a working relationship between organizations who may not have identified a shared vision.
- Supporting networking among K-12 faculty and staff. Often, these informal networks provide untapped potential for connecting schools and industries to regional STEM STW opportunities.
- Encouraging collaboration across STEM disciplines. By connecting across departments, we can enrich understanding of viable STEM STW careers and connect students to industry partners that can offer diverse experiences for career exploration and preparation.

Vibrant Virginia Project-Improving the Virginia Electric Power Company Canal in Fredericksburg, VA-Final Report

Project background

Fredericksburg abuts the scenic Rappahannock River; along which lies a former hydropower and navigation canal formerly owned by the Virginia Electric Power Company (VEPCO). The VEPCO Canal, also known as the Rappahannock Canal, is a vestige of a much larger system of locks and dams that were built in the mid-1800s (City of Fredericksburg, n.d.-b; Hodge, 2018). During the 1980s, the VEPCO Canal ran from a water supply intake on the Rappahannock River upstream of the former Embry Dam to a control weir along Princess Ann St., thence to a tunnel beneath Ford St. to the now-defunct Embry Hydropower Plant and finally discharged to the Rappahannock River. The current Canal, now owned by the City of Fredericksburg, follows this current course, except the inflow from the River source at Embry Dam is now blocked, as the dam was removed in 1984 (Virginia Places, n.d.). Presently, the only water that enters the Canal is runoff from its upstream drainage basin of approximately 1.3 mi^2 (see Figure 1) or water that is pumped from the Rappahannock River. Parallel to the Canal is a much-used recreational path. An existing aeration system is operating within the Canal.

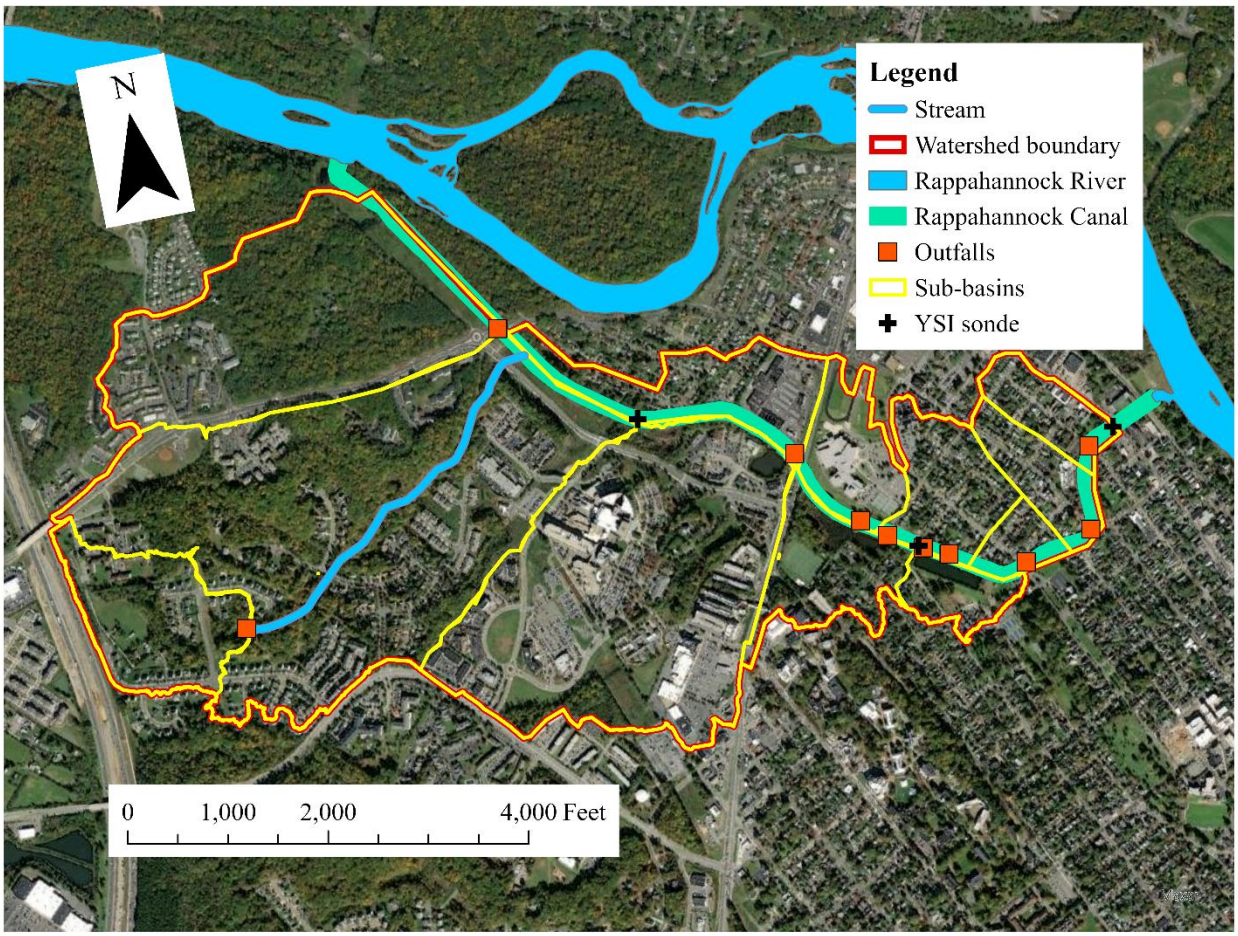

Figure 1. Canal and associated watershed and subbasins in Fredericksburg, VA.

Project description: The focus of this project is the development of a water quality model of the Canal which is being calibrated using data collected in the summer of 2022. The model will be used to assess the water quality within the Canal and at its discharge to the Rappahannock River. Currently, the focus of the Canal model is on critical conditions, i.e., summertime periods with little to no rainfall, and thus, limited runoff discharged to the canal. From the water quality perspective, this is the worst-case, or critical condition, as there is little to no inflow of fresh water with higher DO entering the Canal. The objective of the Canal water quality model is to simulate dissolved oxygen (DO) within the Canal and use the model results to make management recommendations with respect to DO concentration within the Canal to meet Virginia water quality standards (minimum of 4 mg/L, daily average of 5 mg/L). DO is used as an indicator of aquatic health within the Canal. Actions that are possible include 1) increasing aeration, by pushing more air through the system or replacing aeration heads to make them more efficient, and 2) increasing the flow and frequency of pumping Rappahannock River water upstream. These actions will improve water quality within the Canal, thus improving the health of aquatic biota and the ecosystem services they provide, and through this process, enhance the aesthetics of the Canal environment.

Virginia Tech is also developing a hydrologic/water quality model of the Canal watershed, which will be calibrated to recently collected runoff quality from five different land uses. The watershed model will simulate flows and pollutant wash-off loads discharged to the Canal at each outfall (see Figure 1) and will incorporate treatment effects by upstream best management practices (BMPs). This model will be complete by the Summer, of 2023.

Key Partners

This project would not have been possibl4 without participation from RIVERE℠, Resources Protection Group, Inc. (RPG), Friends of the Rappahannock, the City of Fredericksburg, Virginia, and Vibrant Virginia, and. RIVERE℠ is a nonprofit nongovernmental organization that aims to develop a world-class environmental center on the Rappahannock River that will foster research and outreach in the Rappahannock watershed. RIVERE℠ was founded by Buck Cox, a Virginia Tech alumni. Resources Protection Group, Inc., is a non-profit organization, founded by Michael Rolband in 2012. RPG's recent efforts include protecting, restoring, and enhancing aquatic resources in stream valleys, upland riparian buffers, and contributing stormwater systems. RIVERE℠ and RPG co-funded a 1-year monitoring effort to assess runoff water quality in the City of Fredericksburg. Friends of the Rappahannock (FOR) is a non-profit conservation organization that works to conserve the entire Rappahannock watershed, across 18 counties, from its headwaters in the Blue Ridge to the Chesapeake Bay. FOR provided field assistance in conducting surveys of the stormwater system and the Canal. The City of Fredericksburg is a small but rapidly growing City situated on the I-95 corridor linking Richmond, Virginia to Washington, DC. Fredericksburg abuts the Rappahannock River. The City operates the stormwater data and the Canal and provided essential geographic information system (GIS) data, as-

builts of the stormwater, aeration(City of Fredericksburg, n.d.-a, 2006), and pumping systems (City of Fredericksburg, 1981). Finally, Vibrant Virginia provided funding for the Canal water quality model through a competitive grant. Vibrant Virginia is a funding program of the Commonwealth of Virginia located at Virginia Tech whose goals include building urban and rural connections across Virginia, addressing economic, social, health, and environmental issues in Virginia communities, and enhancing the impact of higher education across the Commonwealth of Virginia.

Methods

Site description and Field data collection: The reach of the canal being modeled runs from the Friends of the Rappahannock Office to the weir at Princess Anne Street. Survey data were collected at 15 cross-sections along the length of this reach, and water quality data were collected near the upstream end of the reach (Figure 2). The upper portion of the canal was not included in the model because, during the summer low flow, it is disconnected from the rest of the canal by a large sediment pile. A multiparameter sonde (YSI 6600 V2) was used to record temperature, dissolved oxygen (DO), pH, and specific conductance. This data was recorded continuously at 15-minute intervals for two days during August when the water temperatures were high and the flow in the canal was low.

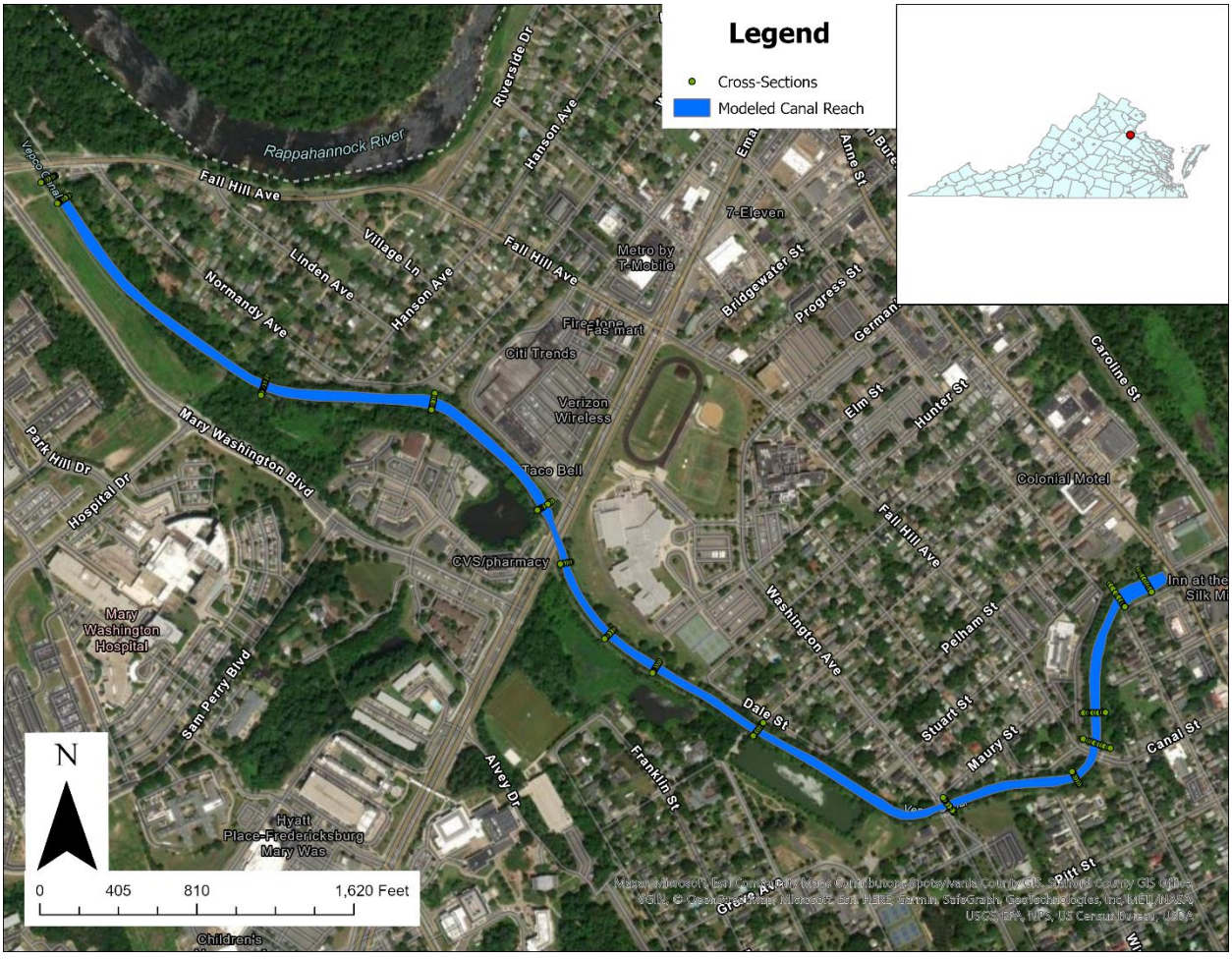

Figure 2. VEPCO Canal modeled reach and cross-section locations.

EVM model: DO was modeled using the Extreme Value Method (EVM) model proposed by (Wang et al., 2003). This model uses a basic oxygen balance with photosynthesis, respiration, and reaeration to describe the rate of change of DO in a stream. The photosynthesis and respiration rates are estimated using the minimum and maximum DO deficits observed in the water during a diurnal cycle. Reaeration is estimated using the DO deficit at any time (t) and a reaeration rate constant. The basic oxygen mass balance equation used in this model is given by:

$$\frac{dC}{dt} = P(t) + k_a(C_s - C) - R \quad (1)$$

where C is the DO concentration (mg/L), t is time in days, $P(t)$ is the photosynthesis rate (mg/l/day), k_a is the reaeration rate constant (d^{-1}), C_s is the saturated DO concentration (mg/L), and R is the general respiration rate (mg/L/day). The photosynthesis rate is a function of time and is approximated as a sine wave during the day and zero at night:

$$P(t) = P_{max}\, sin\left(\frac{\pi t}{f}\right), \;\; 0 \le t \le f \quad (2)$$
$$P(t) = 0, \;\; f \le t \le \tau$$

where P_{max} is the maximum photosynthesis rate (mg/L/day), f is the photoperiod (h), and τ is the length of the day (24 h). The reaeration constant was estimated with different equations depending on the conditions. For this model the reaeration constant was estimated for three different conditions, standing water with wind, standing water with no wind, and flowing water; these conditions are represented in equations 3, 4, and, 5, respectively (Chapra, 1997; Nguyen et al., 2015).

$$k_a = \frac{1.3189U_w^{0.5} - 0.317U_w + 0.01134U_w^2}{H} \quad (3)$$

$$k_a = 0.081\exp(0.0302T) \quad (4)$$

$$k_a = 12.9\frac{U^{0.5}}{H^{1.5}} \quad (5)$$

U_w is wind speed (ft/s), H is mean depth (ft), T is the water temperature (°C), and U is water velocity (ft/s).

Model Scenarios: Various scenarios were developed to explore different conditions; with the ultimate objective to increase the DO concentration of the canal using two engineering controls, pumped flow to the top of the reach, and a reaeration system. These engineering controls were integrated into the model through additional terms in the DO mass balance equation. For the pumped flow scenarios, the DO mass balance is given by:

$$\frac{dC}{dt} = P(t) + k_a(C_s - C) - R + \frac{QC_{in}}{V} - \frac{QC}{V} \quad (6)$$

where Q is the flow rate (ft^3/day), C_{in} is the DO concentration of the pumped water (mg/L), and V is the volume of water in the model segment (ft^3). A HEC-RAS (Hydrologic Engineering Center River Analysis System) model (U.S. Army Corps of Engineers, 2023) of the Canal was used to simulate the pumped flow through the canal. The HEC-RAS model results give segment volume, water depth, and water velocity values as inputs for the EVM DO model. The pumped water DO concentration (C_{in}) was

obtained from a nearby USGS gaging station on the Rappahannock River (USGS (U.S. Geological Survey), 2023). The DO mass balance for the reaeration system scenarios is given by:

$$\frac{dC}{dt} = P(t) + k_a(C_s - C) - R + A \quad (7)$$

with '*A*' being the rate of DO addition (mg/L/day).

Model Segmentation: For the EVM DO model, the Canal was simulated as a series of continuously stirred tank reactors. The Canal was split into three segments, based on water depth and modeled water velocity. These parameters were then used to estimate the reaeration rate of flowing water. The Canal was segmented at locations with relatively large drops in channel bottom elevation and changes in modeled water velocity; this ensures that the reaeration can be reasonably estimated for the entire length of the Canal.

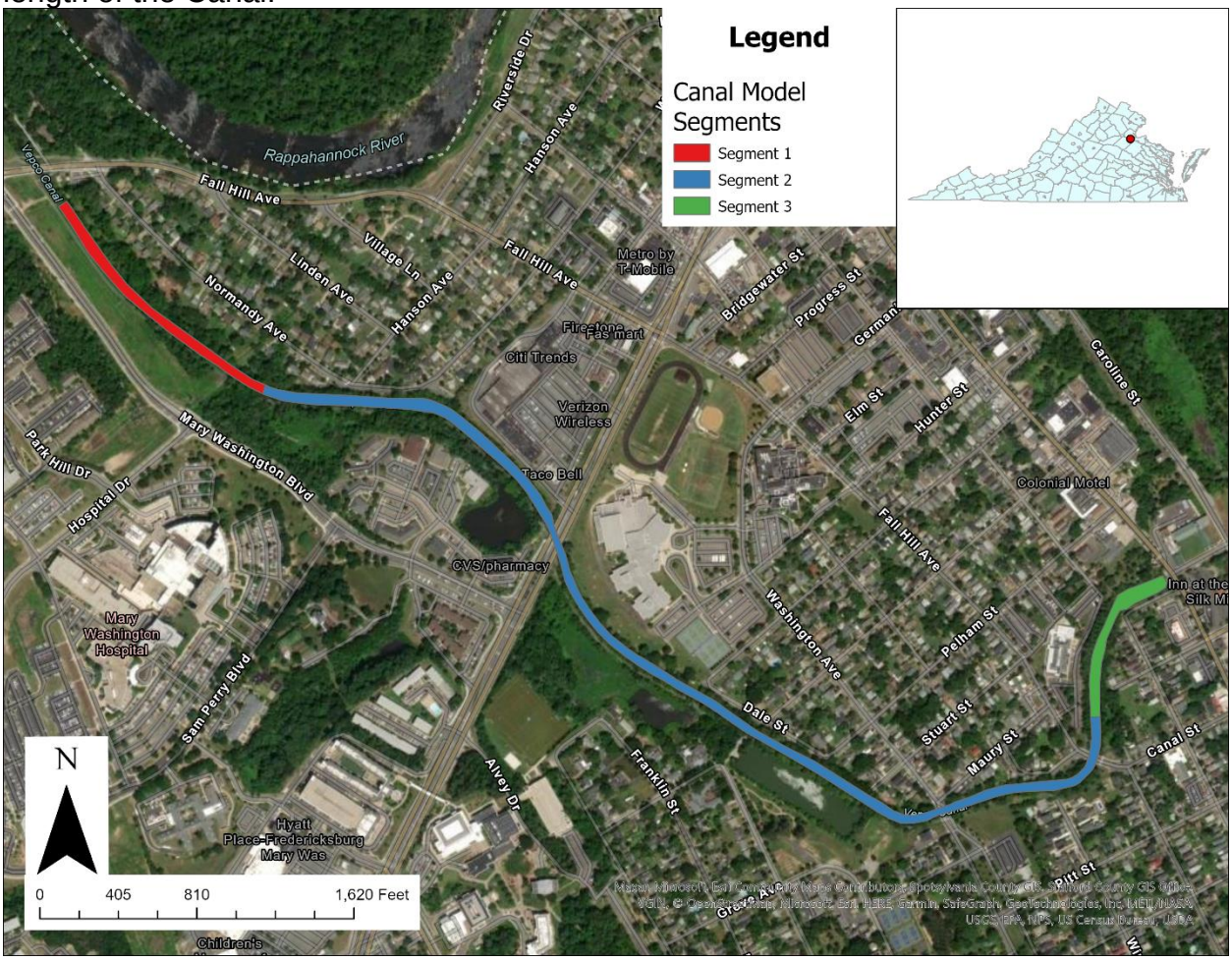

Figure 3. VEPCO Canal EVM Model Segments.

Results/key findings

Currently, flow in the Canal has only been modeled at a single magnitude of 60 cfs. Figure 4 shows a comparison of modeled and observed DO concentrations for the

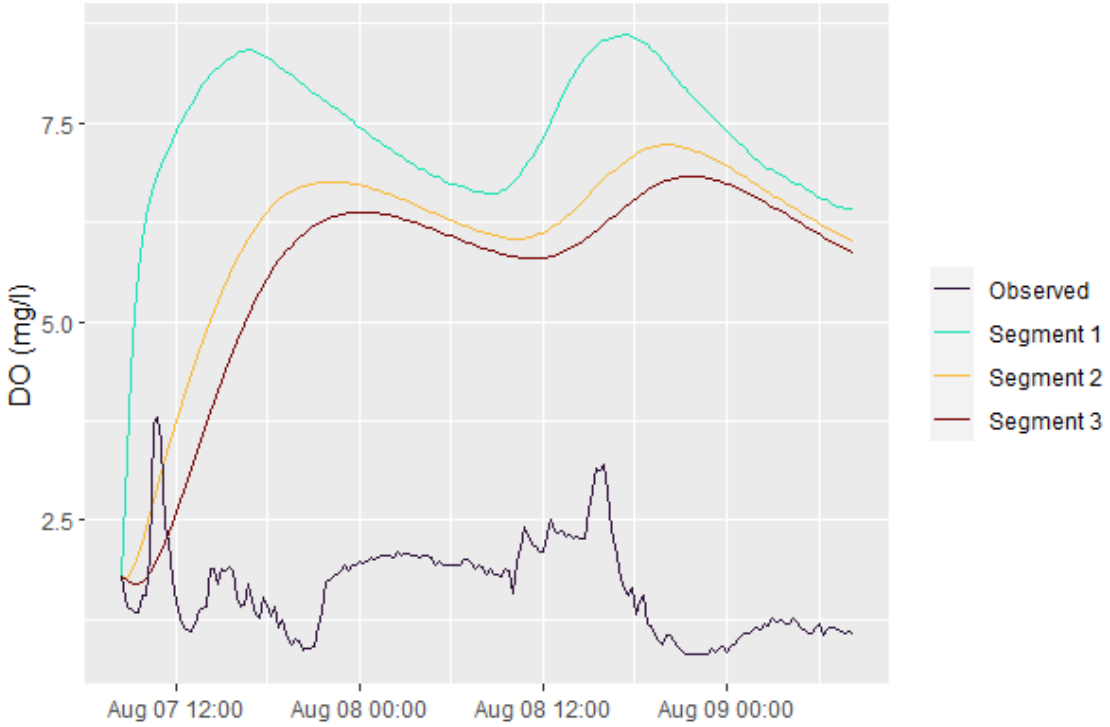

Figure 4. Observed DO and modeled DO for 60 cfs pumped flow.

Canal over two days. The inclusion of this flow magnitude in the model increased the DO concentration in all segments to well above Virginia water quality standards.

Accomplishments

- We adapted a water quality model to the VEPCO Canal during critical conditions.
- We are performing sensitivity analysis of the model with two engineering options for adding dissolved oxygen to the Canal.

Barriers

- Small Cities are challenged with managing aging infrastructure; often critical design information is unavailable.
- Due to their uneven grades and shallow slopes, Canals are difficult to model.

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Analyzing and Improving Vaccine Uptake among Latinx Populations in SW Virginia

PI: Julie Gerdes, PhD

Final Report

February 24, 2023

This report outlines the work done under the Vibrant Virginia Impact Fund project "Analyzing and Improving Vaccine Uptake among Latinx Populations in SW Virginia." With these funds, we were able to successfully complete a participatory action research project that directly involved members of the Latinx community living in the Roanoke Valley in the telling of their pandemic experience, in turn understanding COVID-19 vaccine perceptions within a broader context of their lives. We also built connections with the Virginia Department of Health that have led to successful community owned grant projects and advocacy.

Project Background

Key Partners

From the outset, we developed a project that called on the expertise of a local nonprofit, Casa Latina, who worked as a liaison to participants. During the pandemic, Casa Latina was feeding thousands of families on a weekly basis as they dealt with COVID's impacts on employment, schooling, illness, and mental health challenges. This work as a nonprofit improved their connections to members of the community and their understanding of pandemic challenges.

We also worked with VT Special Collections, the VT Carilion School of Medicine Library, the Center for Rhetoric in Society, the VT Center for Public Health Practice and Research, the Virginia Department of Health, and CENEDADH, a human rights nonprofit organization.

Project Design and Implementation

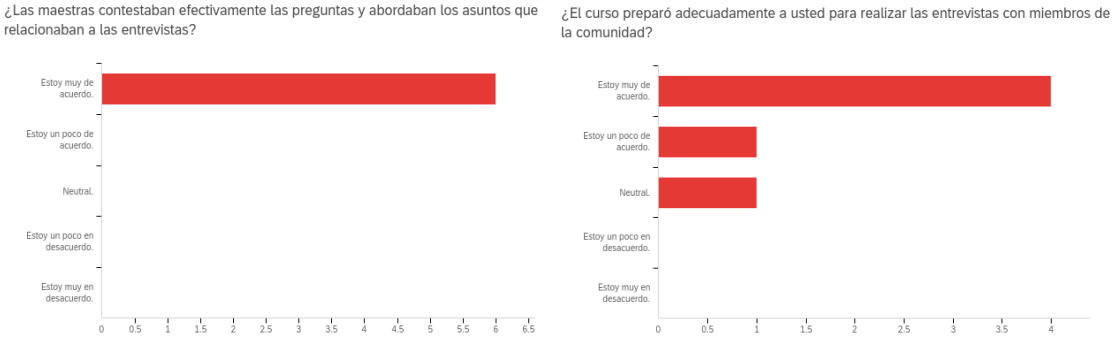
In our proposal, we pitched "formative research activities that include community dialogue and listening sessions, reflection activities of stakeholder workshops, action in the form of educational activities specified in listening sessions, evaluation of success through outcome monitoring." We expected that this would happen through a series of listening sessions and focus groups about the pandemic in which we limited the collection of PII. This plan blossom into a much more public educational experience for community members.

In consultation with leadership at Casa Latina, we offered Virginia Tech continuing education credits and certificate for Latinx community members to enroll in a bilingual class on oral history, interviewing, basic filmmaking, and public health. Course sessions occurred weekly on Mondays from 4:30-6:30pm in person in Roanoke between February 7 and April 11. We enrolled 16 students, with 8 participating on a reliable and regular basis and 6 ultimately receiving certificates and credit. Student participants ranged in age from 16-50 and were from Venezuela, Honduras, Guatemala, and Mexico.

We covered a wide range of topics related to public health, interviewing, and oral history over the course of ten sessions (see Appendix A). A graduate research assistant at the Center for Rhetoric in Society helped develop slide decks, and Master of Public Health students helped prepare the classroom, get students signed in, and take notes. Course sessions were largely devoted to discussion and review of slide material, although we shifted to more active engagement as we observed the energy and motivation of this voluntary class. Some students were not able to complete attendance because their work schedules shifted unpredictably. Another left early to make it to an English language class that she needed for employment. After each class meeting, we recorded attendance and gathered notes from flip charts and notepads.

Figure 1: Students in "Grabando Historia" (Recording History) learn videography techniques from professional photographer David Hungate at a recent Monday meeting

At the conclusion of the ten-week course, students completed an evaluation survey. In it, the majority of students responding to the survey stated that they felt prepared by the class to conduct the interviews, and all of the students felt that the teachers were effective at answering questions and resolving issues. Six of the participants were involved in the interviewing, with some participants recording multiple interviews with different community members.



Under the question “which topics would you have liked to have learned more about?,” responses mirrored in-class feedback in that respondents indicated a desire to learn more about technical subjects like videography, editing, data analysis, and general practical skills. In future projects, we intend to a) clarify expectations of research and educational projects; and b) improve participatory design elements to respond to community requests relative to transferable or employable skills within the constraints of a program.

During the implementation of these class sessions, we learned that class time would not suffice for captioning and editing the videos. Because of the restrictions of the technology for these tasks, we spent class time learning about captions and practicing them on borrowed laptops. To complete this process, we enlisted the generous support of the VT Captioning Services, who were able to complete official captions in Spanish for our videos free of charge.

We also learned that two of our participants were particularly skilled interviewers and particularly active in the community. As such, we used grant funds to hire them as consultants to collect additional interviews. We conducted a training session and reviewed consent protocols, letter of donation forms for interviews to be included in the VT Special Collections archive, and on how to use, charge, and maintain equipment. During class sessions, we had borrowed a set of video cameras from the Lending Desk in the Newman Library, but these were only to be checked out for a week, and we did not want to be fully responsible for this equipment leaving our oversight. As such, we purchased two sets of basic tripods, video recorders, and audio recorders, which we provided to these two former students. We compensated their time for interviews, and they returned over 20 complete interviews in return.

After captioning and organizing all videos, I continued to work with one former student (the other was no longer available due to personal reasons) and with Casa Latina organizers to review and understand the content from a culturally centered perspective. We created a collaborative analysis scheme and reviewed three videos separately to check on intercoder reliability. We divided the remaining videos for analysis between the two of us. Eventually, we developed recommendations based on our findings.

Findings and Recommendations

We learned a great deal about vaccine perceptions in this project. Based on a combination of the interviews we collected, class discussions, and student/participant surveys, we conclude:

1. Despite Virginia Department of Health and similar authorities' concerns, access to vaccines was not a concern for the Latinx community in the Roanoke Valley. This community knows how and where to access vaccinations though community campaigns and the Bradley Free Clinic but more commonly through big-name pharmacies. People were able to get vaccine products without concern for transportation or language barriers.
2. Barriers to vaccination are largely rooted in systemic issues of health equity: access to affordable health insurance and services and, relatedly, routine primary care providers. People with providers that they know and see regularly do not report wanting more information about vaccines as those who do not have routine providers.
3. Relatedly, members of the Latinx community in Roanoke who want more information about vaccines would rather ask a friend or coworker who works in any capacity in the medical field for advice than to seek it online or through formal channels.
4. Language, culture, and representation as interrelated issues play major roles in the acceptance of vaccine and other health information. In the Roanoke area, it's not enough to post Spanish language information or flyers based on a direct translation of English language content. Community members commented that they don't hang out downtown and that if health departments want to reach them, then they need to come to the shops, restaurants, and other businesses where the community does gather and that they need

to engage in dialogue. Moreover, having a Latinx representative from the New River health department at the final meeting elicited agreement that having representation in positions with public health agencies helped them feel comfortable engaging in dialogue and asking questions about medical issues like immunization.

5. While religion was mentioned in conversations about vaccination, it does not play a major role in vaccine decision making for this community (those who reference religion equally used it in arguments for and against vaccine acceptance).
6. While mandates worked for COVID-19 shots for essential workers, they were seen to do more harm in the long run—creating wider gaps in trust, increasing suspicion of the vaccine and those associated with its distribution, and not effectively motivating folks for other vaccines such as against influenza or future COVID-19 boosters.
7. Also related to working conditions, people expressed that a major barrier and fear around the vaccine was short-term side effects that could keep them home from essential work and thus out of a day's wages.
8. There was little indication across data sources that people perceived that the vaccine was ineffective. Rather, the belief that it was developed too quickly was very common.
9. The experience and perspectives of the vaccine for Latin America immigrants living in the U.S. was often influenced by their country of origin, if they had recently immigrated and/or maintained close relationships with people in said country. Some participants from Venezuela, for example, compared their experience with poor health infrastructure there to what they perceived as high access to healthcare in the U.S., and they reported gratitude for access as a motivation to get vaccinated.
10. Participants who agreed to be interviewed reported that they had heard of myths and rumors of the vaccine, and many dismissed them as emerging from a lack of information (for example, one person said that she had heard things like that the vaccine causes cancer then dismissed it as "cosas ridículas, sólo porque no sabemos que realmente son, la gente le tiene miedo es porque no saben" ("ridiculous things; only [said] because we don't know really what [vaccines] are. People are scared because they don't know"). One of the most frequently reported rumors from this project was related to paranormal activity—for example, that the vaccine would convert people into UFOs.
11. Through this project, participants optimistically identified positive outcomes of the pandemic, including empathy for others, improvements in digital literacy (especially for parents of school-aged children), increased appreciation for what we had previously taken for granted (for example new appreciation of kids for school), and improving overall hygiene practices. A participant in the project added this question to the interview protocol, which sparked a lot of reflection and agreement in the classroom and in the interviews.
12. Nevertheless, many people in the community suffered from poor mental health outcomes of the pandemic, many of which were related to fears and anxieties of being separated from family and friends and of being exposed to the virus at job sites or of losing jobs altogether. Many people lost family members overseas to COVID-19 or spend time in the hospital in Roanoke while loved ones were severely sick. Others closed their businesses. Nearly all lamented the negative impact of fear and isolation, citing a culture of community, celebration, and dancing in times outside of COVID-19.

Overall, we recommend that public health communicators include elements of participatory design in future campaigns that are meant to reach Latinx audiences, and we recommend

sustained relationships with the community throughout non-emergency times to improve representation and to better understand needs when emergencies hit.

Structural changes must address access to health insurance and to Spanish-speaking doctors in preventative care offices. Because health insurance in the U.S. systematically excludes day wage earners and undocumented residents, it creates barriers to dialogue from people's most trusted source: routine medical providers or primary care physicians. Health departments can overcome this to a degree by hiring Spanish-speaking and Latinx staff members to do outreach in the community. However, spending resources on one-directional information that has been translated to Spanish is likely to have a low return on investment.

Continued Opportunities

This project has resulted in three very notable but unanticipated outcomes:

1. One of the student participants from the community, who works at a human rights nonprofit, went on to successfully seek a Roanoke City Vaccine Equity Grant. Through this grant, his nonprofit organization collected additional footage from across community members of people telling their stories. This footage was developed into a comprehensive and coherent bilingual documentary, which launched at the Grandin Theatre in Roanoke in February. At the launch event, members of the Roanoke health district (including the director), the City of Roanoke Mayor Sherman Lea, City Councilwoman Vivian Sanchez-Jones, and many other representatives of area organizations such as United Way, Bradley Free Clinic, and Planned Parenthood attended. I was asked to speak based on my experience with this project, and the conversation about needs of the Latinx community during health emergencies has continued, with substantial commitment to improvements. There are currently additional showings happening at local high schools and area events.

Figure 2: Flyer for "It's Not About Me, It's About Us," a documentary follow-on from this project that featured Gerdes and Tilley-Lubbs and was produced by project participants

2. This project has contributed to the development of my current book project: *Infectious Timing: Health Equity in the Making of Public Health Emergencies*, which was recently offered an advanced contract. In this book, I pull on conversations, interviews, and the experience as a whole to discuss tensions between health departments and marginalized communities during public health emergencies.
3. Because of a VT News story about this grant-funded project, I was contacted by a senior professor in computer science who is working on pandemic prediction research. Together with other collaborators, we are developing methods for conducting research on pandemic prediction and prevention that centers community knowledge and feedback. We are pending a decision on a $3M NSF NRT grant, and we are actively working with a $50,000 Destination Area 2.0 Project planning grant to develop a full proposal that would feature community engagement in future pandemic research at VT and beyond. Relatedly, I am on a pending CDC grant, also out of computer science, which looks to

develop a tool that can predict vaccine misinformation and which, with my input, would incorporate both community and health department feedback.

I am confident that without this Vibrant Virginia grant, these opportunities would not have emerged. The framework and initial learning that happened in this short project is serving as a model and foundation for continued work in health equity that moves beyond just responding to outbreaks after the fact but also anticipates and works against inequities before disease outbreaks occur.

Publicity and Presentations

- The College of Liberal Arts and Human Sciences published a story on March 18, 2022 about this project.
- On March 22, 2022, Jessica Taylor, oral historian at VT, organized a panel discussion about Casa Latina at which we will present on our work to faculty and graduate students.
- In May 2022, Casa Latina director and the project's PI presented our project as an autoethnographic essay at the International Congress of Qualitative Inquiry.
- In a February 22, 2023 Spanish-language interview on local news, the director of the follow-on documentary references the class project as exigence for their work. It's highlighted on local English-language news sites as well.

We expect that, in addition to scholarly presentations and the book project, several publications in the form of scholarly articles will come out of this work, and that all will be coauthored with community members who were involved. This grant project improved knowledge in vaccine perceptions, but perhaps the most important contributions have been methodological and community oriented. The work continues to live on in the community, and leadership in the city is enthusiastic about improving health equity for its Latinx residents through thorough listening and improved representation.

Contact: For inquiries about this project, please contact PI Julie Gerdes, jgerdes@vt.edu.

Appendix A: Session Topics

Session Number	Date	Topic
1	Feb 7	**Introduction to the Course and to Epistemology**
2	Feb 14	**What is Oral History?**
3	Feb 21	**The Art of Interviewing**
4	Feb 28	**The Practice of Interviewing** ** Visit from Special Guest and Professional Videographer David Hungate*
5	March 7	***Interview Session*** **Held at FBRI Technology Library at VT Carilion in Roanoke; dinners provided*
6	March 14	**Postproduction: Editing Videos for the Web**
7	March 21	**What's this got to do with public health?** ** Presentation produced and delivered by VT Master in Public Health students as part of their Integrated Learning Experience requirements*
8	March 28	**Accessibility: Captioning Your Videos**
9	April 4	**Reflection on the Pandemic and its Vaccines**
10	April 11	**Conclusion and Sharing** **Included listening session with visitors from Virginia Department of Health representatives of Roanoke/Alleghany and New River Health Districts*

Vibrant Virginia Impact Fund Interim Report
Comprehensive Capacity Building Experiential Learning (CCBEL) Model
Cornelia Deagle, PhD, MSPH

February 23, 2022

Summary of Funded Proposal:

The CCBEL model is designed to build capacity of all parties (i.e., students, community partners, faculty member) engaged in the experiential learning. The proposed model is designed to support a positive, health promoting community-university partnership through *sustained engagement* with designated community partners and a *commitment of resources* from the university in terms of the faculty expertise and graduate students working on community prioritized public health issues in partnership with community partners.

Milestones, Barriers and Accomplishments

1. **Personnel Changes**

   The CCBEL team went through significant transitions over the past three months. First, the community partner at Roanoke Cooperative Extension left her position at the end of December 2021. The team discussed the options for moving forward including (1) bringing on a new staff member at the Roanoke Cooperative Extension OR (2) identifying another Cooperative Extension site in close geographic area.

   Resolution

   After many discussions regarding timeframes and HR processes etc., the team decided to implement option #2 above and invited the Cooperative Extension expert in Montgomery/Floyd to join the team and become the second site for the model.
   We are pleased to introduce our Montgomery/Floyd partner, Dawn Barnes! Our re-configured team had our initial meeting and discussed the model and "start-up" for our second site. Dawn brings a great deal of community health expertise to the team and, in addition, has experience working with students and student projects.

2. **Fiscal Management**

   The funding streams for this project were new to the Va-MD College of Veterinary Medicine, so the fiscal team in the college worked very hard to set up the correct infrastructure to manage the funds.

   Resolution

   The university partner team had several discussions and established the appropriate monitoring and approval system. Once the system was in place, the funds were received. No funds have been spent to date (see #3 below).

3. **Research Assistant**

   The CCBEL model project proposed an implementation timeline over the 2021-2022 academic year. Unfortunately, due to "start-up" lag, the timeframe shifted and the first job posting for a Research Assistant (a key individual needed for successful

implementation) was also delayed. The impact was that the two semesters of work would be shifted and the pool of students eligible to fill the position was reduced.

Resolution

The position was first posted within the Department of Population Health Sciences (home department for Dr. Deagle) in late January 2022. The position was next sent to the College of Agriculture and Life Sciences early February 2022. Fortunately, as of 2.23.22, Dr. Deagle has identified a public health student with great promise for the position. The team needs to meet and discuss but hopefully the Research Assistant position will be filled for Fall 2022-Spring 2023 academic year.

Progress Review and Assistance Needed

First, the Vibrant Virginia funding opportunity provided great support and encouragement for the CCBEL team. The funding award provided fiscal support but also a validation of the model and confidence in the community-university partnership to contribute to the health of the communities with which we work in student experiential learning.

Second, there were two significant barriers to on-time implementation of the proposed work. The community site personnel change was significant because this CCBEL partnership model was new and not yet "institutionalized" into the participating organizations. Also, the coordination of all the activities necessary for start-up and the delays in hiring the Research Assistant has resulted in delays in expending funds.

Assistance Needed

The CCBEL team is requesting a no-cost extension of the entirety of funds for the 2022-2023 academic year. The project is expected to be implemented as planned in the proposal with the only change being the replacement of Roanoke Cooperative Extension with **Montgomery/Floyd Cooperative Extension** as explained above.

Thank you,

The CCBEL Model Team:
Dawn Barnes MS, AFC, Montgomery Floyd
Laura Reasor, FCS, Pulaski/Giles
Cornelia Deagle, PhD, MSPH

Final Report
February 24, 2023

l. Project Background and description, including key partners

The CCBEL model is designed to build capacity of all parties (i.e., students, community partners, faculty member) engaged in the experiential learning. The proposed model is designed to support a positive, health promoting community-university partnership through *sustained engagement* with designated community partners and a *commitment of resources* from the university in terms of the faculty expertise and graduate students working on community prioritized public health issues in partnership with community partners.

In Fall 2022, four teams of graduate students worked within the counties of Montgomery, Floyd, Pulaski and Giles (i.e. one team in each county). Because of the change of community partner from Roanoke Cooperative Extension in 2021-2021 to Montgomery-Floyd Cooperative Extension in 2022, only the students working in Pulaski County were building upon work conducted by prior MPH graduate students' community fieldwork. The teams in Montgomery, Floyd and Giles counties were charged with establishing new partnerships and a new VT=CE partnership "presence" within the communities.

Following the processes of community engagement and best practices in public health community organizing, the students began the fieldwork with windshield tours, geo-spacial mapping, assets mapping and professional reflections. For each community, the students applied the ecological model to possible public health issues and designed a community engagement approach based upon one of the key public health models discussed in the course (e.g., Healthy Cities/Healthy Communities from WHO, Collective Impact from the National Council of Nonprofits, MAPP (Mobilizing for Action through Planning and Partnerships) from the NACCHO (National Association of County and City Health Officials) and CHIP from the CDC. The students reviewed secondary data regarding the health of their community field placement and conducted interviews with community leaders within their field community to compare and contrast the *lived experience* versus the existing quantitative health data. Throughout the semester, student teams progressed through the community engagement processes, prepared reports and presented their experiences to the class. The culmination of their experiences and reports were compiled into a portfolio which was shared with the community partners. These portfolios include key assessments, lessons learned and recommendations by the students for the next student teams that will be working within the four sites.

The course is designed around MPH core competencies. These competencies are documented and showcased within the reports that the student teams are required to produce. In accordance with the standards for experiential learning, students also completed several personal reflections that are guided by critical, professional milestones that are incorporated into the course materials.

The Key partners continue to be Dawn Barns and Laura Reasor (Cooperative Extension), Cornelia Deagle (VT) and Leslie Hoglund (ODU).

ll. Accomplishments

Portfolios: The key accomplishments include the individual portfolios completed for each county including the PowerPoint presentations, the establishment of partners in new communities and continuing relationships in Pulaski. In addition, the CCBEL model resulted in improved planning, communications and supportive activities that will inform the situational analysis for Cooperative Extension this year.

Student Support: There was additional student support through both field experience and the qualitative interviews for the MPH Students. Also, the Vibrant Virginia funding supported a BSPH student who gained real-life public health experience and community organizing through the student assistance funds.

Unexpected infrastructure accomplishment: Due to the design of the CCBEL model as an ongoing university-community collaboration, another BSPH student is currently engaged with one of the communities for their practicum that is required for graduation May 2023. Furthermore, additional undergraduate practicum opportunities are evolving in **all four counties** which is not only valuable for the BSPH students and program (since each student must complete a practicum for graduation in public health), but also for the communities with which we serve because the public health issues identified by the graduate student teams are then further explored or defined or in some way addressed by the BSPH students. It is important to note that this continuum of engagement across semesters, furthers the relationships, builds trust and, over time, has the potential to improve the health of the partnering communities.

Unexpected faculty and community partner scholarship accomplishment: While the course, “Methods of Community Health Engagement” is grounded in public health competencies and utilizes established best practices and texts in the field, the Vibrant Virginia funding opportunity allowed the partners to extend their engagement activities and enhance the student experience into a continuity of partnership and learning. With this “bonus” of activities, a gap was identified. There is no graduate student resource guide or “toolkit” for students to use that takes them through the community engagement/organization process. The CCBEL team has developed an outline (attachment) and continues to build this toolkit with the intent to publish it as a resource for public health student field placements.

lll. Barriers

There were two barriers to the implementation of the CCBEL model as originally proposal. First, our team had a delayed start and we were not able to fully convene our team until three months into the initial year. Fortunately, we were granted a no-cost extension and thus were able to proceed with our proposed plans with a delayed launch.

Second, the faculty partner suffered a critical health issue which paused work for approximately eight weeks. The graduate students were able to continue their assignments and complete the coursework with support from community partners and the fieldwork teams.

IV. Key Findings

The partnership continues and the work continues but we have some preliminary findings. First, the Vibrant Virginia funding provided the opportunity to “pilot test” the model. We have proven that the model is *feasible* (i.e. students can complete fieldwork and the envisioned “snapshot portfolio” in a semester), it is valuable *experiential learning* for the students (based upon the

student reflections), the student work is *useful* for community partners and it is possible for a single faculty member to oversee the placements of public health graduate students within four communities while incorporating the fieldwork into classroom learning.

We (the faculty and community partners) are in the process of drafting the public health student toolkit and plan on submitting the guide for publication within the year.

Finally, the partners plan on applying for further funding to continue building the infrastructure necessary for successful implementation of the CCBEL model.