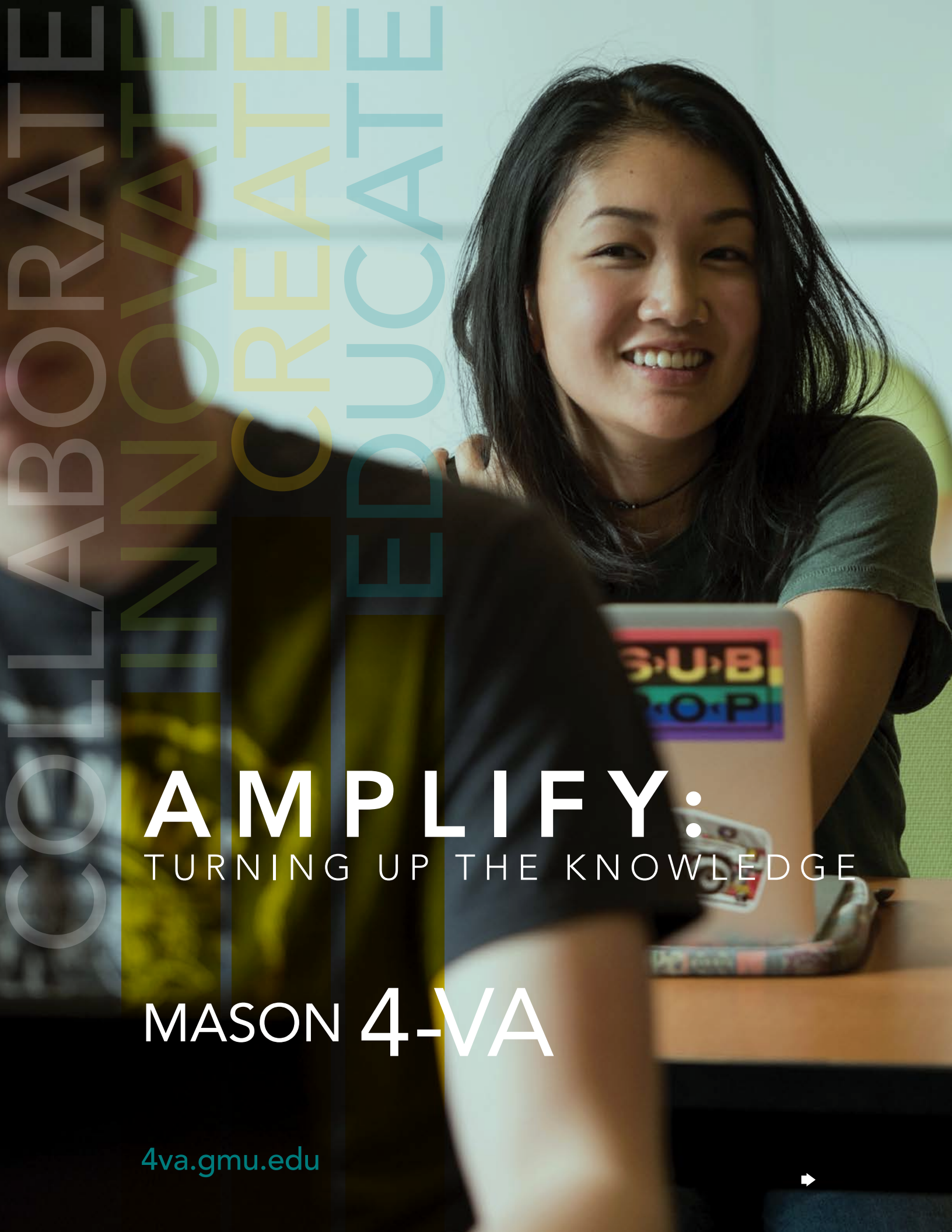

AMPLIFY:

TURNING UP THE KNOWLEDGE

MASON 4-VA

4va.gmu.edu

4-VA: TURNING UP THE INNOVATION

At George Mason University, we pride ourselves on our innovation, our entrepreneurial spirit, and our accessibility. We see things not only as they are, but also as what they could be.

That's why we were pleased to be selected as a founding member of the 4-VA Program in 2010 when it was formed as a result of recommendations by both the Virginia Governor's Higher Education Commission and the Commission on Economic Development and Job Creation. We knew that by working together, we could help identify innovations in higher education to foster greater access to our university system and grow collaborative research for the good of our students, faculty, economy, and the commonwealth.

Today, we continue to be proud of our leadership role in 4-VA. I am pleased to be joined by my fellow 4-VA coordinators from Virginia Tech, James Madison University, Old Dominion University, Virginia Commonwealth University, and the University of Virginia, along with the Virginia Secretary of Education and the director of the State Council of Higher Education for Virginia.

Thanks to 4-VA funding, we're paving pathways for more students to gain access to a four-year degree, providing new opportunities for careers in cutting-edge studies such as cyber technology, and offering collaborative resources for research, course sharing, and course redesign—all of which result in cost savings for Virginians. Essentially, we identify that single note of purpose and possibility, and we turn up the sound—giving rise to a good idea and making it great.

While it's one thing to say 4-VA is an education success story, it's another to show it.

Take a look through the following pages, and see for yourself the 4-VA value. We know you'll be impressed with the results.

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AMPLIFY:
TURNING UP THE KNOWLEDGE

***Amplify* is produced annually by the 4-VA at Mason Team:**

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Amplify was written by Elizabeth Gillooly

Amplify was produced by George Mason University Creative Services

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EXIT

COLLABORATE. INNOVATE. CREATE. EDUCATE.

Together, we are stronger. The relationships we have built with our partner schools bring valuable assets to bear on the challenges and opportunities facing the state university system. Through 4-VA, each school leverages its unique strengths and resources to further a shared goal. For instance, combining the technological resources from one campus with the rich historical archives of another and the performing arts expertise at a third can more effectively accelerate the pace and production of an extraordinary final product.

By and large, the 4-VA effort is focused on these areas:

- Grants for Collaborative and Complementary Research
- Support for Identifying and Developing Open Educational Resources (OER)
- Course Sharing and Redesign
- Degree Completion
- Curriculum Development

Whether it is a grant for a groundbreaking study on microbial phage evolution, or supporting faculty in the development of dynamic OER lesson plans to bring a language and culture alive for their students, or seamlessly transitioning undergraduates from Northern Virginia Community College (NOVA) to Mason, the 4-VA effort finds that perfect pitch and dials it up a notch.

At Mason, we're particularly focused on expanding Open Educational Resources—providing broader access to digitized materials while offering a cost savings for students.

Importantly, the 4-VA mission aligns closely with the goals and strategies of the State Council of Higher Education for Virginia—making higher education more affordable and attainable.

4-VA RESULTS: VIRGINIA JOBS, NATIONAL RECOGNITION, AND BOTTOM-LINE SAVINGS

Thanks to new pedagogy, educational opportunities, and the pioneering science, technology, engineering, and mathematics (STEM) programs developed through 4-VA, Virginians are being trained for a wide range of in-demand and growing jobs, from bioinformatics to cybersecurity. Students are leaving Mason and partner schools with a resume that truly opens doors—especially in the Northern Virginia area, where technology is a robust driver of the economy.

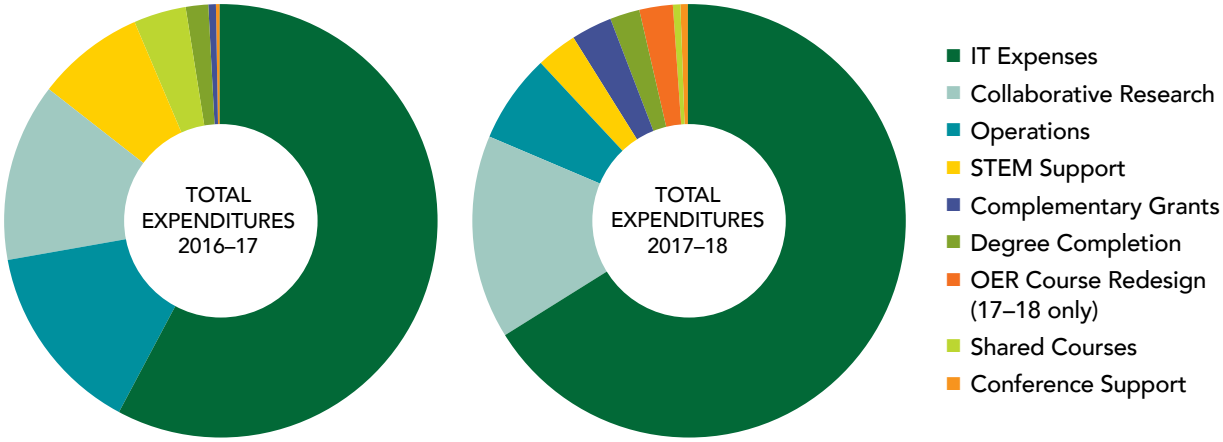
A 4-VA grant is often the seed money that launches continued student and faculty research efforts into the larger universe of funding, including NASA, the U.S. Department of State, the National Science Foundation, the World Bank, and the U.S. Department of Education.

What's more, many 4-VA funded programs have been introduced to national and international academic audiences via presentations at conferences, conventions, and symposiums.

An important outcome of 4-VA, however, extends even further beyond the goals of mission-driven research, leading-edge teaching tools, or greater access to courses and educational opportunities.

The most overarching benefit? Cost savings. The 4-VA team at Mason carefully studies each request for funding to assess its potential impact for reducing expenses while improving results for our students. Whether it is cost savings for text-books, reducing food waste and expense in our university dining halls, or producing an affordably priced system to develop flood alerts for Virginia's residents, we're finding and fueling the most effective, inventive, and resourceful prospects to do more—efficiently.

MAKING IT COUNT
Small Expenditures, Big Results



MASON 4-VA TOTAL PROJECTS

13 Collaborative Research Grants

7 Complementary Grants

19 OER Course Redesign

14 Shared Courses

>TECHNOLOGY INITIATIVES

The majority of the 4-VA funding is used to keep Mason's telepresence rooms and classrooms in tip-top technological shape. In addition to maintaining, updating, and refreshing the telepresence rooms—currently located on three of our campuses—4-VA funding was used to introduce Webex throughout campus, providing on-demand collaboration, online meeting, web conferencing, and videoconferencing applications for students and faculty. The introduction of this access meets an important goal set by Mason's provost—to make technology more collaborative.

COLLABORATION PARTNERS

- James Madison University (Harrisonburg)
- Old Dominion University (Norfolk)
- University of Virginia (Charlottesville)
- Virginia Commonwealth University
- Virginia Tech (Blacksburg)

- Smithsonian-Mason School of Conservation
- Aspiring Scientists Summer Internship Program
- Thomas Jefferson High School for Science and Technology
- Noyce Scholars for Advanced Placement and International Baccalaureate High School Curriculum
- Governor's School
- Rural and Diverse Student Scholars
- STEM support for Virginia's high schools, community colleges, and four-year colleges
- Sodexo
- Aramark
- Virginia Farmers
- Virginia Food Aggregators and Distributors
- Virginia Cooperative Extension Service

LIGHTING THE EDUCATION PATHWAY

Be it easing the transition from Northern Virginia Community College, creating access to online degrees in partnership with Old Dominion University, or providing curriculum for cybersecurity careers of the future, 4-VA at Mason is committed to ensuring access to higher education, transformative learning, and degree completion for Virginians.

The collaboration continues with our partners in the 4-VA project, working together to identify shared challenges and opportunities within the state system with regard to general education, specifically in enrollment management, transfer student support, and transfer equivalencies.

Recognizing and nurturing programs that light the way for students to achieve success in their pursuit of higher education is part and parcel of the 4-VA mission and aligns closely with Mason's strategic plan. We work with a variety of different offices on campus to:

- support traditionally underserved populations, including veterans, adult learners, and first-generation college attendees;
- collaborate with area business, industry, and government leaders to identify potential jobs of the future and plug gaps in skill sets for area workers; and
- assist faculty in designing effective e-learning for face-to-face courses, technology-enhanced face-to-face courses, hybrid courses, and 100 percent online courses.

Working together—within the Mason community, through our partner schools, with our state and local leaders, and with area businesses—4-VA amplifies educational resources for the greater good.

IDENTIFYING AND AMPLIFYING Innovative Research

Harnessing Crowd-Sourcing and Internet of Things Technology to Create Real-Time Flood Alerts

▶In a lab tucked into the back of the Nguyen Engineering Building on George Mason University's Fairfax Campus, a group of undergraduate students, graduate students, and doctoral candidates from a wide range of disciplines—engineering, geography, and computer science—tackle a joint effort and shared passion: Flood hazards research.

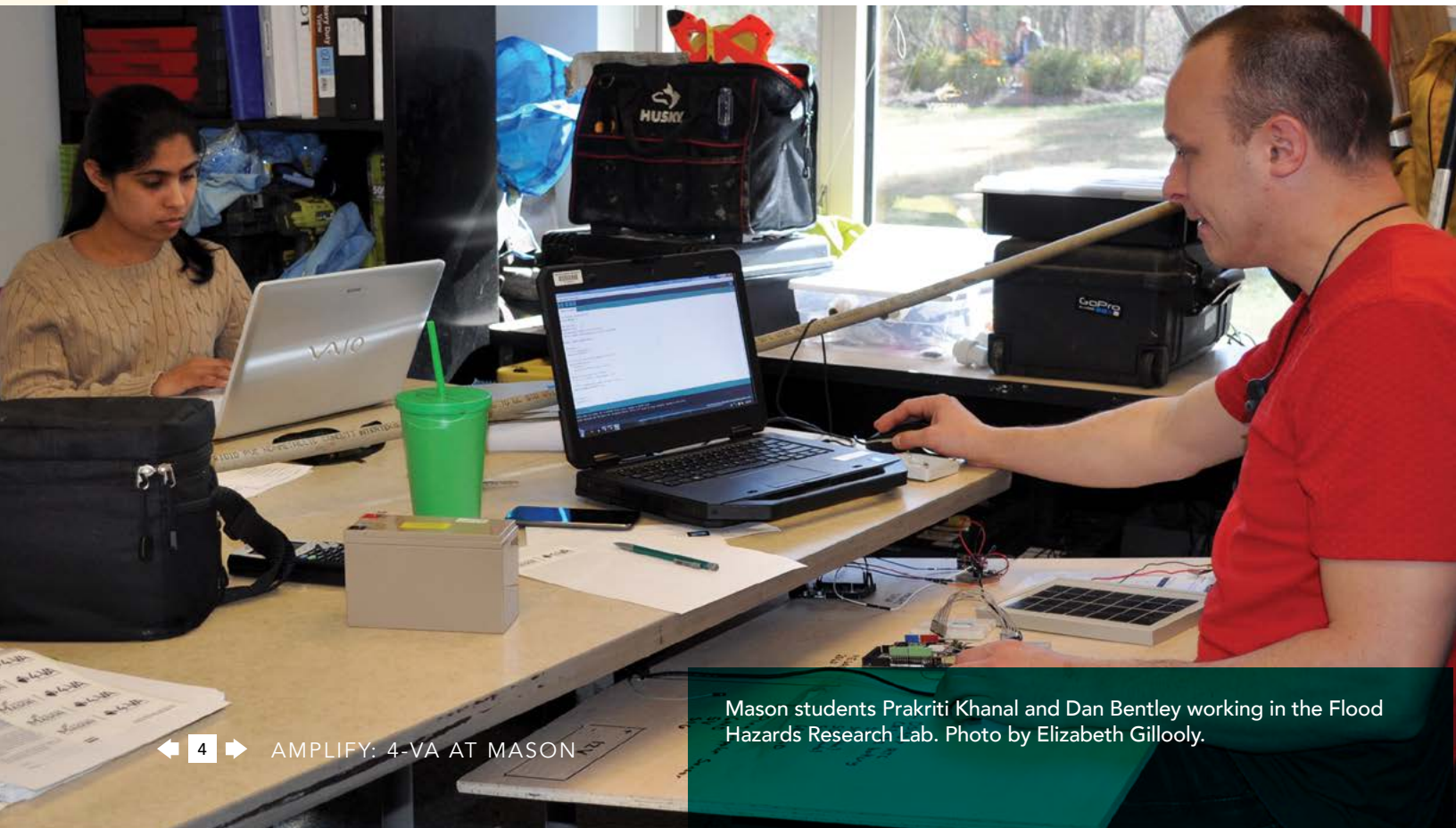
Welcome to the Mason Flood Hazards Research Lab and Team Ferreira.

This 4-VA-funded project team—led by Celso Ferreira, PhD, an associate professor at Mason who specializes in water resources engineering—is collaborating through their work on *SurgeNOW: Enabling Real-time Weather Coastal Flooding Forecasts in the Chesapeake Bay*, a pioneering system to predict floods and create flood threat alerts in real time throughout the Chesapeake Bay region.

WATER POWER: A PERSONAL, PROFESSIONAL, AND PROPERTY TAKEAWAY

Brazilian native Ferreira initially became interested in the flow of water as a surfer growing up near the Atlantic Ocean. However, his focus on water flow grew by several chance turns in his career path—the first when he arrived at Texas A&M University as Hurricane Ike slammed through Galveston in 2008; and again in 2012 when Hurricane Sandy hit the East Coast shortly after Ferreira began his career at Mason. Those fateful encounters offered Ferreira a front row seat to the powerful effects of nature's greatest resource.

"In addition to loss of life, flooding can have devastating economic consequences," explains Ferreira. "Superstorm Sandy caused an estimated $50 billion in damage, and



Mason students Prakriti Khanal and Dan Bentley working in the Flood Hazards Research Lab. Photo by Elizabeth Gillooly.

more recently, Hurricane Matthew resulted in extensive flooding throughout Virginia. Understanding more about flood waters is critically important for the commonwealth."

THE NECESSARY SCIENCE

Ferreira's vision to revolutionize the way citizens along the Chesapeake Bay receive essential flood alert warnings necessitates that a variety of elements be brought to bear on his project, including:

- Amalgamation of numerical models for hindcasting and forecasting storm surges;
- Integration of existing radar networks, hydrodynamic and wave models, climate models, tropical storm wind and pressure parametric models, tidal databases, and river discharge data;
- Utilization of critical expertise developed by Virginia Tech coastal engineering professor Jennifer L. Irish to determine probabilistic maximum hurricane surge;
- Incorporation of a smart mesh network to collect data from Mason's five existing field site stations at coastal and emergent areas in the Chesapeake Bay, which monitor water levels, current velocities, wave spectra, and atmospheric variables (Currently, data is collected for retrieving and downloading via periodical travel to the sites, which are hundreds of miles away from each other.);
- Development of a geographical information system framework based on a data model developed at Mason known as Arc StormSurge.

Once these important elements are in place, Ferreira explains that a critical component of the project is the development of internet of things (IoT) mobile sensors. Through these sensors, to be deployed in recreational boats scattered throughout the Chesapeake, statistics on water flow can be collected and disseminated in real time, providing data critical to predicting storm surges. "Through hundreds of monitors throughout the bay, rather than a single or a scattered few portals, we will essentially be employing crowdsourced and resourced information," Ferreira says.

He adds: "Using IoT technology opens this project up to millions of data collection points and provides not only scientists, but residents of the Chesapeake Bay, the opportunity to get valuable lifesaving indicators that can protect people and property."

Tyler Miesse and Prakriti Khanal monitor equipment and record data at the Magothy Bay field station. Photo by Flood Hazards Research Lab.

At the crux of the IoT challenge is the development of a sensor that is both reliable and affordable, with the second requirement being paramount to the execution of the project. "To truly capture the crowdsourced element of this effort, it is imperative that the sensors be reasonably priced for widespread dissemination," says Ferreira. "Currently, the sensors we use can range from $5,000 to $10,000. Naturally that's not a feasible price tag if we want to cover the bay." Ferreira's goal is to produce a sensor for no more than $200.

TEAM PLAYERS

Building and refining that sensor currently falls squarely in the lap of Mason Engineering student Dan Bentley. We find Bentley in the lab, balancing before him a plywood board mounted with various components of said sensor—including a battery, solar panel, satellite modem, and microcontroller. He understands the value and importance of the data being collected and relayed. "The data that the sensors will monitor and send to the cloud or through a cellular network will be vital to the project," says Bentley. "These sensors must be accurate and dependable."

Across from Bentley sits engineering major Prakriti Khanal, who is knee deep in research on tides, when the conversation in the lab turns to the group's last trip to the field site stations on the bay. They discuss the various responsibilities for each team member and results of the outing, with Khanal duly noting that every trip begins with one important first stop. "We head to Wawa and get coffee!" she says with a laugh.

Two of the students in the lab that day are looking not at the water, but more specifically at the land that the water may impact.

Thanks to the digital maps in development by project member and geography major Tirik Ford, the group can calculate the results of coastal flooding on the landforms lining the waters of the Chesapeake. Ford is working on refining his elevation map of the land surrounding Magothy Bay—sharing the information with the others in the room.

Farther up the bank of computers in the lab is Selina Jahan Sumi, a PhD candidate with a focus on water resources engineering. Sumi is busy integrating data from both the National Oceanic and Atmospheric Administration and the United States Geological Survey into her maps. She is taking a deep look at how flooding might affect the landforms near the upper Potomac River and the sixth-most-populated metropolitan area in the United States: Washington, D.C.

The conversation then circles back to field station visits. That's when engineering student Tyler Miesse pulls out some of the equipment they brought to the stations to measure the water level and assess water flow in the marsh. Miesse, who was raised in Virginia Beach and who shares a love of surfing with Ferreira, is acutely interested in the role of the marshes during extreme storm events. "The salt marshes are critically important to the life of the bay," he says. "The vegetation within the marsh efficiently weakens and reduces the waves during storm surges and provides a key defense for the land."

Ferreira notes, however, that the *SurgeNOW* effort goes well beyond the lab partners we meet today. "This 4-VA grant allowed us to pull a wide range of people and resources together—Arslaan Khalid, an engineering major who developed a prototype system on "Poseidon," our supercomputing cluster; Thomas Jefferson High School for Science and Technology student Pavani Ravella, who transitioned our system from one platform to another; and of course, Seth Lawler, a master's student [who] helped launch the thought process thanks to the boat he keeps on the Chesapeake!"

It's a team project that will return important results for the Chesapeake Bay community.

TOUCH POINTS

- **Mason**
  Celso Ferreira
- **Virginia Tech**
  Jennifer L. Irish
- **Aspiring Scientists Summer Internship Program**
- **Thomas Jefferson High School for Science and Technology**
- **Mason Undergraduate and Graduate Students**
  Arslaan Khalid, Seth Lawler, Selina Jahan Sumi, Tyler Miesse, Tirik Ford, Dan Bentley, and Prakriti Khanal

"This 4-VA grant allowed us to pull a wide range of people and resources together."

— Celso Ferreira

Pairing Cutting-Edge Technology with Old-School Pedagogy

▶As several members of the *Computational Analysis of Microbial Evolution: Building a Scaffold to Teach Next-Generation Sequencing in the Biology Department* research group recently joined together to take a closer look at a particular data set in question, proof of the foundation of the project—collaboration—is evident.

In an office at Mason's Science and Technology Campus in Manassas, Virginia, the discussion begins with student Sarah Vanderplas, who recently graduated with a BS in biology and concentrations in biotech and molecular biology, as well as microbiology. Vanderplas chats about editing source code to create a Next-Generation Sequencing (NGS) device, the Oxford Nanopore, viable for classroom application. Vanderplas's passion? Developing new computer programs that solve complex problems and, most of all, run efficiently.

Jasmine Amirzadegan is next to assess the data. A PhD candidate studying bioinformatics and computational biology, Amirzadegan has worked with Reid Schwebach, PhD, (the principal investigator of the study who has since left the university) during its post-data collection and computational processing phase. She has also spent a substantial amount of her time at Mason sharing what she's learned via class presentations, seminar lectures, teaching an undergraduate biology lab, and mentoring.

While Amirzadegan pulls up her chair to the computer churning out thousands of data points, Pat Gillevet, PhD, (coprincipal investigator on the project) scans the screen for the specific set in question. Gillevet, a professor in the Biology Department and also the director of the Microbiome Analysis Center at the Science and Technology Campus, has a decades-long history in microbiology, biochemistry, molecular biology, bioinformatics, and molecular evolution. Gillevet honed his studies at, among other research centers, the Center for Prokaryotic Genome Analysis, the Harvard Genome Laboratory, and the National Center for Human Genome Research at the National Institutes of Health.

The group is soon joined by lead principal investigator Schwebach, who has steered this project since its inception. Schwebach's extensive CV includes a wide array of degrees—ranging from a BS in agriculture from the University of New Mexico and a PhD in microbiology and immunology from the Albert Einstein College of Medicine, to an MA in international educational development from Columbia University concentrating in school leadership—with several more diplomas in between. While Schwebach has a vast amount of experience in phage ecology and microbiome coevolution, it is clear that his true calling is education and mentoring—skill sets developed while teaching science in a New York City public high school.

NEXT-GENERATION SEQUENCER: A GIANT LEAP FORWARD

Schwebach's group then crosses the hallway to the state-of-the-art facility at the Microbiome Analysis Center where Gillevet and the students greet Technical Director Masoumeh Sikaroodi. Once in the lab, the team proudly

From left, Dr. Masoumeh Sikaroodi and Dr. Reid Schwebach review findings with students Sarah Vanderplas and Jasmine Amirzadegan. Photo by Elizabeth Gillooly.

gathers around the prized NGS. Gillevet recounts the extensive changes from the previous DNA sequencing processes as compared to the much more effective and affordable NGS. (Gillevet still keeps the old DNA sequencer from his days at the National Institutes of Health in his lab—part history lesson and part nostalgia.) Although the students do not share Gillevet's personal experience with the former operations, they do marvel at the capabilities and the staggering speed of the NGS.

Schwebach and Gillevet agree that this avenue of bioinformatics study provides authentic research opportunities for students. For these students, as well as dozens of others, this project has been a catalyst that inspired computational approaches in their course work and future research. Both Schwebach and Gillevet see bioinformatics as a burgeoning career path in Virginia—particularly Northern Virginia.

THE EXTENDED REACH

However, while the science is still getting done, Schwebach's project has morphed into a multifaceted teaching and learning venture, with faculty and current and future students benefitting from outcomes, including:

- video curriculum modules emphasizing Next-Generation Sequencing techniques;
- tutorials to use QIIME software;
- improved curriculum for career-relevant courses and degree concentrations in the bioinformatics experience at Mason;
- collaboration with Aureliano Bombarely Gomez of Virginia Tech's Biocomplexity Institute;
- bioinformatics instructional and curriculum resources for high school teachers;
- summer research experiences for students at the Governor's School at Innovation Park; and
- distance learning segments for one of Schwebach's pet projects, *Rural and Diverse Student Scholars*—making the online resources available for high school students in rural Virginia and providing important access to research opportunities.

MOVING AHEAD WITH SHARED RESOURCES, RESEARCH, AND A ROBUST JOB MARKET

Clearly, Schwebach relishes the chance to bring the research group—of all ages and interests—together to forward the project, but also, each other. "I believe strongly in the 'one room schoolhouse' approach to education," explains Schwebach. "We all grow individually and as a group when we learn from each other's interests, backgrounds, and methodologies."

Moreover, Schwebach sees tremendous potential for his students and opportunities for job growth in the field. To take advantage of these possibilities, Amirzadegan and Vanderplas are compiling a list of relevant bioinformatics skills for an educational publication.

But most of all, Schwebach is particularly proud of the number of young women who have chosen this field of study, thanks to the continued outreach to attract students to this project and the field of bioinformatics.

"I think about the tremendous effect this 4-VA grant has had on Virginia," says Schwebach. "Look around this room—and just imagine what this one grant has provided for these students and so many others here at Mason. I would want our state leaders to understand the value and impact of this funding—it's amazing."

TOUCH POINTS

- **Mason**
  J. Reid Schwebach, Pat Gillevet, Anne Scherer
  Master of science student Linda Chillin
  Doctoral student Jasmine Amirzadegan
  Undergraduate and Graduate Students in Bioinformatics
- **James Madison**
  Steve Cresawn
- **Virginia Tech**
  Aureliano Bombarely Gomez
- **NOYCE Scholars for Advanced Placement and International Baccalaureate High School Curriculum**
- **Governor's School Programming**
- **Rural and Diverse Student Scholars**
- **Support for STEM students in Virginia's high schools, community colleges, and four-year colleges**
- **National Science Foundation Grant**

A Remarkable Chance Encounter: Exploring the Universe, Extending Shared Resources, and Expanding Mason's Scientific Brand

▶Thanks to happenstance and a 4-VA grant to investigate the origins of super massive black holes (SMBH), Mason physics and astronomy professor Shobita Satyapal, PhD, and her team detected a noteworthy find: A distant, colliding galaxy hosting a binary active galactic nucleus (AGN).

Although there are strong theoretical rationales about why binary AGN should exist, finding them is extremely rare—only a handful have currently been identified with separations of less than a few tens of light years apart. With Satyapal's sighting, a supposition was developed that a significant population of binary AGNs may be hidden from optical wavelengths: A heavenly breakthrough.

THE WHERE AND HOW OF EXPLORATION

Satyapal's group at Mason, with their expertise in analysis of X-ray data, began collaborating with Anca Constantin, PhD, at James Madison University, who established a program to study the reduction of data from the Large Binocular Telescope (LBT) in Arizona, and Sabrina Stierwalt, PhD, of the University of Virginia, an expert on very large array (VLA) data.

Their goals included:

- determining the true frequency of binary AGNs and estimating their black hole masses;
- comparing AGN incidences and properties to host galaxy and merger potential; and
- contrasting infrared-selected binary AGNs to optically identified binary AGNs.

Then, the search was on to find binary AGNs in a sample of 15 colliding galaxies, for which the team secured highly competitive Chandra and XMM-Newton observations. Each participating university brought on both graduate and undergraduate students to assist in data analysis and modeling.

As for their results, they identified a notable eight additional binary AGNs in their sample of 15—increasing the fraction of known binary AGNs in the universe at these close separations by a remarkable 30 percent.

What's more, the findings generated significant scientific buzz for Satyapal and Mason with a NASA press release and an accepted publication in *The Astrophysical Journal* (and another in the works).

Illustration courtesy of NASA and M. Weiss (Chandra X-ray Center)

Further, the collaboration encouraged an undergraduate student from Madison to move forward into Mason's graduate program—helping build an even stronger bridge between the two institutions.

"This 4-VA funding gave us the seed money, which allowed us to do the exploring we needed at the outset of this project," explains Satyapal. "What began as a lucky accident has morphed into a statewide study, which has received national and international attention and garnered additional research dollars—for that, we are very grateful!"

TOUCH POINTS

- **Mason**
  Shobita Satyapal
- **James Madison**
  Anca Constantin
- **University of Virginia**
  Sabrina Stierwalt
- **Current and Former Students**
  Paul McNulty, Ryan Pfeifle, Jason Ferguson, Jenna Cann
- **Publications**
  NASA
  The Astrophysical Journal
- **Technology**
  Secured Chandra and MM-Newton observations

Greenhouse and gardens specialist Doni Nolan working in one of the campus greenhouses with Professor Andrew Wingfield. Photo by Elizabeth Gillooly.

Seeds of Change: Cultivating the Next Crop of Food Systems Leaders

▶Accessing locally sourced, sustainably produced fresh food is both a movement and a hot topic nationwide and throughout Virginia—stretching from rural Shenandoah Valley farms to trendy Alexandria restaurants. However, thanks to a 4-VA grant, the concept has evolved from just a conversation to a course of study, led by Andrew Wingfield, director of Mason's Environmental and Sustainability Studies Program.

The Virginia Food Systems Leadership Institute (VFSLI) was first discussed in 2015 at a 4-VA-funded symposium that brought together interested faculty—representing Virginia Tech, the University of Virginia, James Madison University, and Mason—to the Smithsonian-Mason School of Conservation in Front Royal, Virginia. Also attending the symposium were campus dining services personnel and sustainability managers.

Once there, teams interacted to learn more about associated activities on each campus. Wingfield explains, "There was a lot of energy in the room as we began to understand that we had a shared purpose and potential for many different collaborative opportunities."

Symposium participants formed the Virginia Sustainable Food Coalition (VSFC). Their mission is to harness the intellectual, human, and economic capital of colleges and universities to foster the emerging local food economy in Virginia.

"Schools are spending millions of dollars on food, and we saw the chance to offer campus food providers an option to source fresh, sustainable, local fare, which would generate both environmental and economic benefits," says Wingfield. "What's more, we also recognized the need to support small- to medium-sized growers by helping them access institutional markets—a real boost for Virginia's rural economy."

In April 2016, a second VSFC symposium convened more than 40 Virginia food system stakeholders, including farmers, processors, distributors, Aramark and Sodexo representatives, and faculty from the four schools. Their focus was to increase university sourcing of Virginia-grown food.

FROM SOUP TO NUTS—A FULL PLATE OF FOOD SYSTEMS STUDIES

Last year, Wingfield and his colleagues launched the development of VFSLI, a course curriculum to serve both undergraduate and graduate students encompassing a wide

range of interdisciplinary studies in food system settings. "We have the unique opportunity to give our students real-world job training on a variety of levels and encourage networking opportunities in food systems. VFSLI students will be well positioned to secure employment within the emerging local food economy that they are helping to create," Wingfield says.

The culmination of this effort came to fruition this summer in a three-part intensive experience beginning with two weeks of learning in residence at the Smithsonian-Mason School of Conservation. There, students combined the study of sustainable food systems with leadership development work. Food systems experts served on panels that addressed local food sourcing, and shared processing infrastructure, labor issues, and strategies for increasing demand for locally sourced food on campuses. Attendees visited farms, kitchens, and food hubs to learn how food moves around the state. The course then continued with collaborative research projects and concluded with team presentations. The focus of the projects identified opportunities to increase Virginia's university sourcing of local and sustainably produced foods.

A STATEWIDE COLLABORATIVE EFFORT

"We've assembled a really dynamic team to teach this course. Along with faculty from the four Virginia universities, we are working with the Smithsonian Institution and bringing together farmers, processors, distributors, dining providers, and representatives from the Virginia Cooperative Extension Service," says Wingfield.

Wingfield is coordinating VFSLI along with Catherine Christen, PhD, of the Smithsonian's Conservation Commons. Participating university faculty include Michael Broderick, PhD, an assistant professor of communications studies, and Wayne Teel, PhD, a professor of integrated science and technology, both from James Madison; Tanya Denckla Cobb, director of the Institute for Environmental Negotiation, University of Virginia; Mike Ellerbrock, PhD, a professor of agricultural and applied economics, Virginia Tech; and Kerri LaCharite, PhD, an assistant professor of nutrition and food studies from Mason.

Wingfield credits the 4-VA program that brought this project together. The multifaceted results will include bringing locally sourced fresh food to college campuses, providing smaller farms access to institutional markets, helping preserve Virginia farmland, and offering job training and networking opportunities for Virginia students interested in food systems professions.

"The 4-VA funding allowed those of us passionate about solving food sourcing and sustainability challenges to join together and create positive change, all while helping our students with a variety of career opportunities," concludes Wingfield. "This is an exciting and dynamic time to be in the food systems business. Thanks to 4-VA, our Virginia students will be at the forefront."

TOUCH POINTS

- **Mason**
  Andrew Wingfield, Kerri LaCharite, Susan Crate
- **University of Virginia**
  Tanya Denckla Cobb, Paul Freedman
- **Virginia Tech**
  Mike Ellerbrock, Alex Hessler
- **James Madison**
  Michael Broderick, Wayne Teel
- **Smithsonian-Mason School of Conservation**
  Stephanie Lessard-Pilon
- **Smithsonian Conservation Commons**
  Catherine Christen
- **Sodexo—Mason Dining**
  Lucian Weavil, Caitlin Lundquist
- **Aramark—JMU**
  Jay Vetter, Amanda Presgraves
- **Aramark—UVA**
  Matthew Smythe
- **Aramark Corporate**
  Brian Szeliga
- **Virginia Tech Dining Services**
  Anthony Purcell, Gwyneth Manser
- **Farmers**
  Joel Salatin, Polyface Farm
- **Food Aggregators and Distributors**
  Samantha Jameson, Local Food Hub
- **Virginia Cooperative Extension Service**
  Caitlin Miller, Eric Benfeldt
- **Harrisonburg City Public Schools**
  Andrea Early
- **Undergraduate and graduate students and nondegree professionals attending the VFSLI courses**

CHANGING THE COURSE: Leading the Charge in Open and Shared Resources

A key component of the 4-VA initiative is the development of Open Educational Resources (OER)—freely accessible, openly licensed text, media, and other digital assets applied for use in a particular course of study.

Indeed, the call for Open Educational Resources begins at the highest level in the commonwealth, with the State Council of Higher Education for Virginia (SCHEV) placing emphasis on OER in their strategic plan and specifically noting the importance of cultivating affordable higher education pathways for traditional, nontraditional, and returning students, as well as aligning state appropriations to ensure that students have broader access to postsecondary education opportunities regardless of their ability to pay. More recently, Virginia Code 23.1-1308 was adopted, calling on all state universities to create and utilize OER content, meeting the commonwealth's goal of "Providing Affordable Access for All."

Although the mission and the journey to achieve these benefits can often be markedly different for each 4-VA grant recipient, several outcomes are consistent:

- provide students with the latest information and guidance on a subject;
- incorporate a variety of media approaches in course materials to engage and enlighten;
- offer self-guided tutorials on the subject that can be digested at students' own pace; and
- create and/or identify associated materials that can inform students on a variety of topics related to the course of study.

Utilizing these options, faculty also have the ability to institute a "flipped" classroom. By providing these materials in advance, students can attend class with a level of understanding of the topic, thus providing the opportunity for more expansive discussion and investigation in class.

Importantly, perhaps the greatest benefit is student savings—reducing or eliminating the outlay for an often-costly textbook.

While the goals are worthy, achieving them can often be fraught with challenges. With the flood of information and resources comes the responsibility of vetting the material and tailoring it to the particular flow of the course, as well as the needs of the students. Often, it is no easy feat. Supervising or conducting this research is time-consuming and demanding. But the results, when carefully produced, are of tremendous benefit.

Thanks to 4-VA, 11 OER projects were successfully accomplished during the most recent academic year, and eight are currently in development, with more to come.

ASTRO 111 AND 113: A FREE TRIP TO THE STARS—AND BACK

Guiding more than 1,000 nonscience majors effortlessly through the universe—on a dime—was the OER challenge recently led by Rebecca Ericson, PhD, along with her coprincipal investigators Mario Gliozzi, PhD, and Gabrielle Belle, PhD.

Students interested in fulfilling a lab science requirement arrive at Astronomy 111 and 113 with a wide range of prior experience—or inexperience—in the subject. That necessitated Ericson's intention to create learning materials that would be "accessible and inspirational, yet intellectually challenging." Moreover, Ericson wanted to allow the inclusion of astronomy news, saying, "At the current pace of science exploration, it's important to make room for new and exciting developments in the field."

Step one for Ericson was to scour OER resources for a suitable beginning point for a text. From there, she allotted the 4-VA funding to colleagues Gliozzi and Belle to begin the task of locating or developing materials to supplement the text, including videos, short activities, and other elements.

As the new materials came together, Gliozzi began to utilize the course materials in a "flipped" format.

Ericson reports that one overarching goal in the course redesign was to save students the cost of an expensive textbook. She notes, "My prior experience was teaching

Above: Professor Mario Gliozzi confers with ASTRO 113 students before the start of class.

Right: Assistant Professor Younsung Kim found that incorporating OER materials for EVPP 338 provided more up-to-date resources for her students.

Photos by Elizabeth Gillooly.

physics and astronomy on the community college level; it was always so distressing to see students pay more for their soon-to-be outdated textbook than the cost of the class credits."

What's more, Ericson reports, "The students received the new materials very enthusiastically—they seem to be really enjoying the fresh approach to the class."

RESULTS:

+ **Textbook costs reduced to $0**
+ **Sparked student interest**

EVPP 337: KEEPING CURRENT IN A RAPIDLY CHANGING ENVIRONMENT

In the six years that Younsung Kim, PhD, has taught EVPP 337 Environmental Policymaking in Developing Countries, she has seen myriad changes in climate, politics, and policy. Consequently, providing her students with the latest information can be problematic.

When considering online and OER materials for her class, Kim knew she was facing a difficult task. She reports that the information found online is either too cumbersome for her undergraduate juniors and seniors or sometimes not technical enough. "Moreover, as environmental and sustainability issues are changing at a breakneck speed, there are numerous materials necessary to review," explains Kim.

The 4-VA grant provided Kim funding for the hours necessary to compile the research. She notes, "there's still so much that can and should be done, but thanks to the 4-VA funding, it meant there was financial support necessary to begin this process."

RESULTS:

+ **Topical, up-to-date resources for students**

SPAN 305, 306, AND 309: LA VIDA ES MÁS COMPLETA

Bringing a language—and a culture—to life was the goal of Mason Spanish language faculty members led by Alexia Vikis, PhD. They sought to reduce the dependence on dry and costly textbooks in the SPAN 305, 306, and 309 course stream and to implement a lively new online curriculum—allowing students to more authentically engage with the rich cultures and histories of the Spanish-speaking world. Their 4-VA grant provided them the means to achieve their goal.

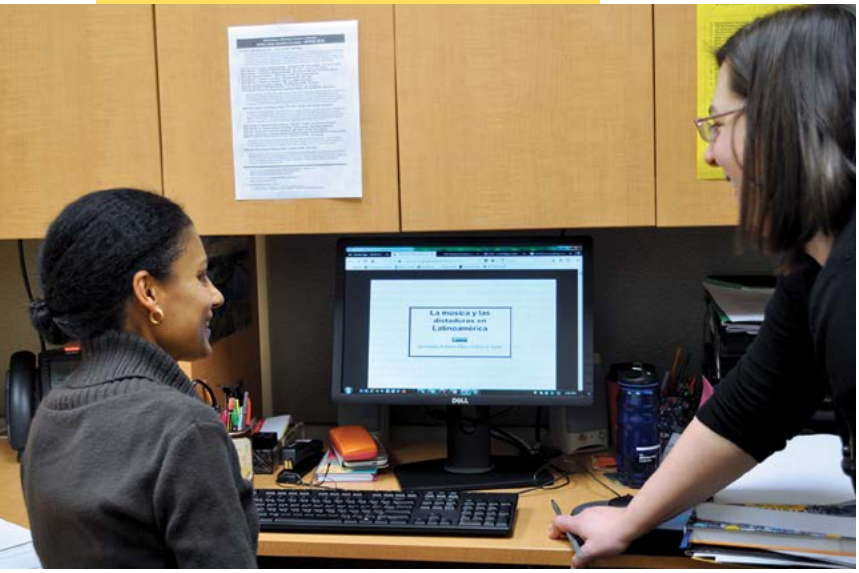
"We began this effort by searching for OER materials already available," says Vikis. "But what we found was that there was a scarcity of OER entirely in Spanish or at the college level, so we had to start creating our own."

Right: A 4-VA grant helped Associate Professor Suzanne Slayden develop less expensive manuals and identify corresponding textbooks for her CHEM 315 lab class.

Below (left to right): Professors Alexia Vikis and Colleen Sweet confer about materials for the Spanish language course stream.

Due to the unique nature of the class, Steven Harris-Scott and collaborator Amy Lewis needed to create their own course materials for students in the INTO Mason program.

Photos by Elizabeth Gillooly.



First, they developed the readings for the first five lessons integral to SPAN 305 and then paired each with activities in vocabulary enrichment, critical thinking, and group discussions.

Vikis concludes, "This course redesign provides our students with a deeper exposure to the Spanish-speaking world. It also allows them to more closely identify with the experiences of people in regions different from their own. We are particularly proud of these results in today's globalized times."

RESULTS:

- **Course-appropriate materials**
- **Lively, engaging resources**

CHEM 315: UPDATING MATERIALS WITHOUT SACRIFICING CONTENT

Going into the project, organic chemistry faculty member Suzanne Slayden, PhD, knew she had her work cut out for her. Finding updated, free, yet solidly developed learning and teaching resources for CHEM 315 Organic Chemistry Laboratory was going to be difficult.

CHEM 315 is a hands-on, intensive, and complex class that demands time and attention from the more than 300 students who take the course each year at Mason. Because of the lab work required, each class size is limited to 24 students, which necessitates multiple sections being offered each semester, taught by a revolving set of teaching assistants.

As a scientist, Slayden knew she did not want to sacrifice one iota of accuracy and precision in the final product. "With so much information, as well as misinformation, floating around out there, I was very skeptical we could find the quick answer," notes Slayden. Her supposition was confirmed during the search for materials.

Although the quest to eliminate purchasing a textbook could not be met completely, during her research, Slayden identified a paperback text that fit the bill, which produced a $150 savings over other textbooks. The 4-VA funding also allowed her to update the aging lab manual.

"Overall, this was worth the time and effort to provide our students great resource materials at a reduced cost," concludes Slayden.

RESULTS:

- **Reduced textbook cost**
- **Maintaining high-quality teaching materials**

INYO 501, 502, AND 504: WELCOMING THE WORLD TO MASON

Renowned as a culturally diverse international university, Mason illustrates its commitment to that distinction through the INTO Mason joint venture. It was created to help transition students with high school diplomas or undergraduate degrees from schools and universities outside the United States into an education at Mason.

INTO Mason provides the multilingual and diverse group of more than 300 international students arriving on campus each year the language and cultural skills necessary to succeed in an American university setting. "Our program is almost without parallel in the U.S.," explains program leader Steven Harris-Scott, PhD. "We're driving the bus on transitioning grad students from their international undergraduate experience to Mason's graduate programs." However, this translates into its own challenges; Harris-Scott concluded there are virtually no adequate off-the-shelf teaching resources available.

Moreover, with five or more different instructors teaching the various courses at any one time and the inevitable faculty turnover from semester to semester, Harris-Scott and collaborator Amy Lewis, EdD, knew they wanted the final course product to be dual-edged: It was imperative that a path for faculty onboarding be incorporated into the platform, as well as a student-facing resource. They also wanted new faculty to have the opportunity to contribute their own lesson plans to allow for the courses to grow and evolve.

When the 4-VA grant was awarded, Harris-Scott and Lewis—along with other course instructors—created an online resource of 12 lessons, ranging from learning reflections to academic integrity to critical thinking. Concludes Harris-Scott, "We think we've built a valuable resource, which we expect will continue to be fine-tuned each semester with each iteration."

RESULTS:

- **One-of-a-kind teaching resource**
- **Expanding Mason's global footprint**

OTHER COMPLETED OER PROJECTS

- **HAP 360 Introduction to Health Information Systems,** *Viral Video in Health Care Policy*, **Farrokh Alemi**
- **HNRS 110 Research Methods, HNRS 302 Research Methods II, HNRS 410 Thesis Proposal, and HNRS 411 Honors College Thesis,** *Meeting the Needs of the Mason Honors College Students*, **Zofia Burr and Richard Todd Stafford**
- **CHEM 211 General Chemistry,** *Better Living in Chemistry with Building Blocks of Math*, **Paul Cooper**
- **HIST 125 Introduction to World History,** *A New Approach to Entry-Level History*, **Jane Hooper**
- **ME 151 Practicum in Engineering,** *Better Tools and Cost Savings for Tomorrow's Engineers*, **Colin Reagle**
- **ENGH 302 Advanced Composition,** *English Department Collaboration = Win for Students and Faculty Alike*, **Catherine E. Saunders**

Hebrew instructor Ester Halleman addresses the Mason students from her home hub in Blacksburg. Photo by Elizabeth Gillooly.

SHARED COURSES: Turning Up the Knowledge across the Commonwealth

SHARED COURSES

The immersive experience in the telepresence rooms throughout the 4-VA system provided one of the first collaborative efforts between campuses at the inception of the program. Using this technology, Mason students have been able to take classes offered at partner schools, while Mason faculty offer classes that are delivered to students at other schools.

HEBR 101 AND 102: SHARED LANGUAGE, SHARED UNDERSTANDING

Not surprisingly, at a university with an international reputation, many Mason students are interested in pursuing studies with an international focus. And while courses in geopolitical interrelations, cultural and religious influences, and current governmental policies can bring students a deeper appreciation of a particular state of affairs, perhaps the most critical element that can bridge any divide is language. A shared language brings conversation, and conversation brings understanding.

Kenna, a sophomore, credits the Hebrew course, delivered by Virginia Tech-based instructor Ester Hallerman, with giving her a leg up on receiving a prized internship in Israel. An international studies major with a concentration in the Israeli/Palestinian conflict, Kenna is confident that listing Hebrew language skills on her application was key. "I took Arabic my freshman year because Hebrew wasn't offered. I emailed everyone I could find at Mason to somehow get into a Hebrew course—I then heard Hebrew was being offered. That was wonderful!"

For Natalie, a religious studies major who has already taken Latin at Mason, studying Hebrew was critical to her higher education goals. When she saw Hebrew listed in the University Catalog as a "shared university" course, she jumped at the opportunity. "Learning Hebrew was really important to my education," says Natalie. "I did a study-abroad program in Jerusalem last year without much understanding of the language—I wish I had this course last year!" Nevertheless, Natalie is appreciative of the chance to add Hebrew to her language skills.

The Hebrew class is taught in a state-of-the-art telepresence room in Mason's Merten Hall.

Hallerman and her students in Blacksburg, Virginia, appear on the three screens situated at the front of the tiers of desks encircling the room. Written materials for the day's lesson—textbooks, workbooks, homework sheets—appear on a screen to the far right. Both rooms are wired for sound, so communication—questions or comments from students in both locations—is effortless.

At the outset of class, Hallerman chats easily with the students back and forth at the two campuses, checking in on one student who was ill the previous week. That conversation results in Hallerman's introduction of the Hebrew words for sickness and health.

Although the class is comfortable taking notes off a whiteboard that Hallerman uses at her home base in Blacksburg, the Mason students were clearly delighted with a surprise visit from Hallerman to their Fairfax Campus classroom during Tech's spring break. "I came up here this week to take advantage of the two different spring break schedules—giving me the chance to meet the Mason students in person," says Hallerman. "But I wanted it to be a surprise—that was key!"

As the Mason students headed to their desks that day, each looked up—shocked to see their professor standing in front of the room, instead of on screen. Their responses were almost identical: "It's like having a celebrity here!" was the group reaction.

Class member Arielle is grateful for the chance to take the class in whatever format it's delivered, be it in person or via distance learning. Getting the opportunity to take Hebrew at Mason was critically important for Arielle, whose future goals are focused on becoming involved in the Middle East peace process. "I started to look at transferring to another college because I had to have Hebrew on my resume," says Arielle, who already has four years of Arabic from high school. "I wanted to take this class so badly. I needed to learn the Hebrew alphabet … and although I have a broad understanding of the Jewish religion already, I appreciate that Ms. Hallerman also brings that cultural depth to the class. I am so happy to have this class … I love this class!"

OTHER MASON SHARED COURSES

- **KORE 110 Elementary Korean**
- **KORE 210 Intermediate Korean**
- **PERS 110 Elementary Persian**
- **PERS 202 Intermediate Persian**
- **PERS 330 Advanced Persian**
- **FREN 391 French for the Business World**
- **GAME 399 Augmented and Virtual Reality**

"Thanks to the 4-VA shared courses, we do not have to limit our Hebrew language classes to students at Tech—this is an effortless and effective way to broaden a knowledge base."

— Ester Hallerman

Pianist Faith Ellen Lam and vocalist James Stevens record pieces for the ReSounding the Archives website. Photo by Chris Preparato.

IN THE WORKS: 4-VA Projects Now Under Way at Mason

The future is bright for 4-VA, with more new, creative, and innovative projects proposed each year. Here's a peek into what's upcoming.

WORLD WAR I: THE MUSIC AND THE MESSAGE

ReSounding the Archives is a collaborative project between Mason, the University of Virginia, and Virginia Tech that brings the music of World War I to life and opens the door to the power of the messages behind America's most popular songs of the time.

Archivists, librarians, faculty, and students connected through research and recordings of WWI era sheet music, including cover art, musical notations, and lyrics. Step one brought together archivists and librarians, as well as students from various history and English departments, to dissect the scores. During step two, performing arts students studied each piece and then provided their artistic take on the music. For the last step, representatives from all three universities worked together to coordinate a special performance in the UVA Colonnade Club's historic Garden Room. That evening, 18 different pieces of music, from "K-K-K Katy" to "Over There" to "Oh, How I Hate to Get Up in the Morning" were delivered to a packed house. Student engineers were on site to record the performance.

Currently, faculty, archivists, and students are building and populating a website to showcase the research, music, and performances. Through the website, they will be able to share the enlightening and entertaining results with the world. Visit resoundingthearchives.org—and enjoy!

IN PROGRESS

Collaborative Research Projects

- *Scalable Molecular Dynamics*, Estela Blaisten-Barojas
- *A New Model for Teaching Communication Skills*, Melissa A. Broeckelman-Post
- *Peer Victimization in the Preschool Years: Associations with Attachment Style and School Adjustment*, Pamela Garner
- *Prognostic Noninvasive Biomarker Investigation of Induced Sputum and Peripheral Blood in IPF,* Geraldine Grant

- *iBus: Smart Dispatch and Signal Control via IoT*, Song Min Kim
- *Virginia Colloquium on the Rhetoric of Health and Medicine*, Heidi Lawrence
- *High-throughput Bee Pathogen Survey: Combining Expertise in Pollinator Biology, Bioinformatics, and Genomics to Yield Insight into Pollinator Health*, Haw Chuan Lim
- *ReSounding the Archives*, Kelly Schrum
- *Critical Post-translational Modifications of the Franscisella Proteome*, Monique van Hoek

Course Redesign Projects

- ASTR 112 Introductory Astronomy Lab: The Solar System; ASTR 114 Introductory Astronomy Lab: Stars, Galaxies, and the Universe; ASTR 115 Finding New Worlds; Gabriele Belle
- ASTR 113 Introductory Astronomy: Stars, Galaxies, and the Universe; Mario Gliozzi
- CHEM 336 Physical Chemistry Lab, Mosissa Fayisa
- ECE 285 Electric Circuit Analysis, Nathalia Peixoto
- ENGH 302 Advanced Composition, Catherine Saunders
- FREN 309 Reading and Writing Skills Development, Raluca Romaniuc
- HIST 125 Introduction to World History, Sheri Huerta
- HIST 121 Formation of the American Republic, Cynthia Kierner

Complementary Research Projects

4-VA at Mason has also supplied funding for faculty to support 4-VA research projects at partner schools.

- *Fighting Infections Before They Begin: Using Topographic Coatings to Reduce the Incident of Bacterial Infections*
  Lead School: Virginia Tech
  Mason Collaborator: Monique van Hoek
- *Creating an Early Childhood Professional Pathway: The AA to BA Articulation Project*
  Lead School: James Madison University
  Mason Collaborator: Julie Kidd
- *Using Debate to Improve Student Learning and Faculty Engagement in Education and Exceptional Education across the Commonwealth*
  Lead School: James Madison University
  Mason Collaborator: Frederick Brigham
- *Using Novel Technologies to Reveal the Effects of Habitat and Resource Quality on Survival and Productivity of Threatened Pollinators*
  Lead School: University of Virginia
  Mason Collaborator: Rebecca Forkner
- *The Role of HCV Exosome in Liver Fibrosis*
  Lead School: University of Virginia
  Mason Collaborator: Ramin Hakami
- *Using Economics Theory to Improve Cloud Resource Utilization with Application Performance Guarantees*
  Lead School: University of Virginia
  Mason Collaborator: Jie Xu

4-VA

Advancing The Commonwealth

4va.gmu.edu

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Advisory Board
The 4-VA Mason Advisory Board helps define the overall goal of the Mason 4-VA Program and guides the conversation with the greater 4-VA collaborative. The board also creates a process for how prospective proposals are funded and reviews proposals for approval.

Advisory Board Members
Kimberly Eby, Associate Provost for Faculty Affairs and Development
Cody Edwards, Associate Provost for Graduate Education
Susan Kehoe, Director, Academic Strategies Information Technology Services
Laura Phelps, Assistant Director, Digital Learning, Stearns Center for Teaching and Learning