



# 4-VA

2019-2020  
**Annual  
Report**

**Featuring**



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**VIRTUAL  
VISITORS**

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*The*  
**FARMERS  
MARKET** goes  
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**Podcasting**  
*about the*  
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# LETTER FROM THE DIRECTOR

Wow, what a year!

We started the 2019-20 academic year by welcoming **Virginia Military Institute** and the **College of William & Mary** to 4-VA (p. 54). With an expanded team of eight Virginia institutions and a positive economy, we were excited about the opportunities this would bring to an already strong collaborative. Our legislators and governor approved some of the most favorable budget plans for higher education in a generation. Then things changed.

The downside of a transient world became very real as the fast-moving coronavirus, or COVID-19 as it became known, quickly spread from a few cases in Seattle to a full-on outbreak in New York and the world. Travel was curtailed, conferences were canceled, and students in the midst of international experiences were brought home. By the time spring break schedules rolled around in March, there was real concern that vacationing students in virus hot spots would bring the contagion back to university campuses. And so campuses were closed—and overnight our institutions went online.



With nearly 10 years of experience coordinating remote courses with partners around the state and around the world, 4-VA was well prepared for many of the challenges that were thrust upon our colleagues. Our ability to conduct **synchronous remote learning experiences** (p. 56), host meetings for groups like the **JMU Board of Visitors** (p. 57), solve problems, such as when a **JMU alumni fabrication company began making PPE** (p. 60), and pivot quickly to address new challenges and requirements like the ones the **Harrisonburg Farmer's Market** faced (p. 58), all demonstrated the value of what we have built. While the governor and the planning team may not have foreseen a global pandemic when they created 4-VA, their visionary work created an agile program that was able to help in a time of real crisis.

As we figured out how to finish a semester with our signature hands-on, team/problem-based courses remotely, pivot our **Pop-Up workshops** (p. 46), and develop our curriculum documents, our JMU X-Labs interns quickly seized the opportunity to share their voice of innovation by **creating a podcast** (p. 72).

We are now halfway through 2020. In preparing for the fall semester, we're challenged to spend the summer welcoming students via video conference as we revise curriculum in a way that can quickly shift from in-person, to hybrid, to distance learning in an instant. Our faculty researchers continue to produce amazing results—remotely—with their undergraduate students. New courses planned for the fall demonstrate the strength and agility of the whole team. The interns continue their work with exciting new interviews for the podcast and relevant Pop-Ups that contribute to the growing innovation ecosystem. **Open Lab** (p. 44) might be different, but JMU X-Labs will still be open, well-supported, and well-documented.

We don't know what's in store, but we're ready.

*Nick Swayne*

Nick Swayne  
Executive Director, 4-VA and JMU X-Labs

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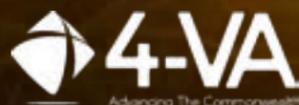
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# CLASSES



## Autonomous Vehicles

VIRTEX, a manufacturing company in Waynesboro, showed interest in JMU engineering students and invited the Autonomous Vehicles class to visit their local plant.

Read more about the class on p. 4.

**Above** | Professor **Nathan Sprague** describes the Autonomous Vehicles project to VIRTEX engineers with the help of student **Alexandra Trembl**.



## Autonomous Vehicles

In the fall of 2019, the Autonomous Vehicles class partnered with Bridgewater Retirement Community in an effort to use human-computer interaction (HCI) to detect passenger movements and provide relevant interactions, support, and services.

### Faculty

NATHAN SPRAGUE Computer Science  
 SAMY EL-TAWAB Integrated Science & Technology  
 MICHAEL STEWART Computer Science

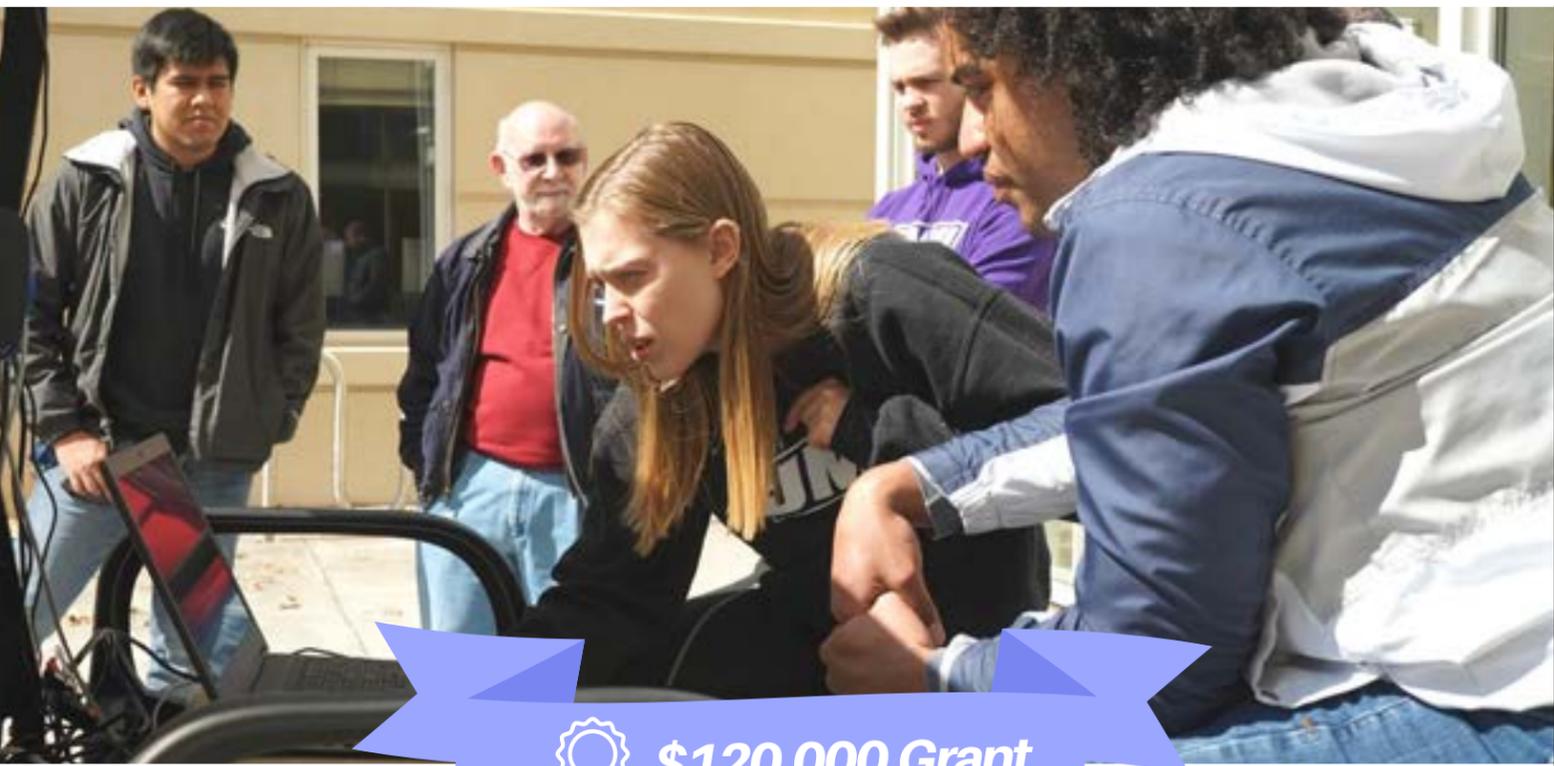


7 MAJORS

### Consultants

DICK SHIMP Retired Engineer

**Left** | Victoria Gaudin and Alexandra Trembl present their team's progress at the end of the semester. **Below** | Madelaine Brower (center) checks the code one last time before doing a live test on campus with (left to right) Jorge Pena, Dick Shimp, Mark Vakarchuk, and Tyree Mitchell.



**\$120,000 Grant**

In July 2019, the faculty team (El-Tawab, Sprague, and Stewart) were awarded The Jeffress Memorial Trust in the amount of \$120,000 for a grant called Independent Mobility for the Elderly to employ machine learning algorithms and user interface design principles to develop autonomous vehicle systems that provide the same sort of passenger-aware interactions used in their classroom project.

## Robotic Process Automation (RPA)

Through a partnership with BRMi, an information technology services firm, this class covers a variety of business and education applications for RPA as well as the means and methods to intelligently optimize work performance. RPA was the first class to use The Tank, a brand new classroom that uses Bluescape, a new visual collaboration workspace.

See more about  
The Tank on page 56.

### Faculty

TREVOR BROWN BRMi



12 MAJORS



**Right** | Prior to the COVID-19 outbreak, students attended RPA in the new classroom, called The Tank. **Below** | Instructor Trevor Brown presents the progress of an RPA project at an innovation summit.





# Augmented/ Virtual Reality

In this class, student teams develop and deliver meaningful AR/VR/360° applications and experiences to client partners for both PC & mobile devices.

Faculty  
JAMES BARNES



## JMU VR Tour

**Right** | One team enhanced the student-created VR tour of JMU's campus by reorganizing content, creating strong user experience design, and involving intuitive usability. The **JMU Undergraduate Admissions Office** hosts the program at a kiosk in Madison Hall for prospective students and their families.



**Left** | A JMU X-Labs **AR/VR team** took the mobile version of the VR tour to a **JMU Board of Visitors** meeting. See page 52.

## Bon Voyage

**Right** | A student team created a virtual reality experience for the **Center for Global Engagement**. The project captures a day in the life of the university's London, England and Salamanca, Spain study abroad experiences to immerse the user into the daily life of a student studying abroad and inspire a desire to travel.



Photo by Picasa 2.7



## Projection Mapping

In 2019, one AR/VR team worked with JMU's Industrial Design program and the Department of Communication Sciences and Disorders to improve interprofessional training and communication among healthcare professionals by creating a multi-user experience via projection mapping. This innovative, low-cost dome was built in order to project a simulated environment and allow for collaborative interactions in a virtual situation.



VR Instructor **James Barnes** watches on as JMU Foundation CEO **Warren Coleman** takes the VR tour of campus, which was created by JMU X-Labs students. See more on page 52.



## COVID-19

**PANDEMIC MENTION** In response to COVID-19, the AR/VR class pivoted from planned projects to explore how immersive technology could address the impacts of the public health crisis. Several teams developed games and relaxation apps (for VR and desktop users), to address stress caused by social isolation. Another team developed a COVID-19 AR app for better visualizing the risks and transmission of the disease.



**Above** | Students from the spring 2020 AR/VR class work on their projects from home during the pandemic.



## Internet of Things (IoT)

Students explored underlying technologies and worked in cross-disciplinary teams to develop minimum viable products that address complex open-ended problems for a variety of industry partners.

### Faculty

DMYTRO BABIK CIS & Business Analytics  
 AUDREY BARNES Industrial Design  
 FRED BRIGGS Teq Strategy  
 KEVIN GIOVANETTI Physics and Astronomy  
 PATRICE LUDWIG Biology

### Consultants

DICK SHIMP Retired Engineer  
 ANGELO ARECCHI Retired Engineer

Left | Victoria Gaudin demonstrates her project for Kevin Giovanetti at an innovation summit.



Photo by William C. Campbell



**\$20,000 Grant**

In August 2019, Patrice Ludwig, Fred Briggs, and Nick Swayne were awarded a \$20,000 Technology for Conservation (T4C) University Grant from Northrop Grumman and Conservation International towards developing an innovative technology that will help them understand animal behavior to make informed conservation decisions. A team of students is using the grant to develop an animal tracking collar with sensors that can remotely detect and characterize terrestrial animal behavior, much like a smartwatch does for humans.

**NORTHROP GRUMMAN**



## Smart Bird House – Do Birds need IoT?

“While probably not for binge-watching Netflix, birds might nevertheless find it useful to have a house equipped with the internet. Researchers are probing into a host of interesting questions about the impact of the environment and human population density on the health and well-being of birds. JMU X-Labs teams from the IoT class equipped a birdhouse with smart sensors, data-recording, and transmitting devices to help provide more and higher quality data for biologists who are studying birds.

The teams are experimenting with methods to weigh young hatchlings as they develop in the nest without disturbing them, filming their comings and goings so as to determine visitation rates of parents and perhaps monitor the food being brought by them. There is a myriad of considerations that extend from effective measurements to harvesting data, to keeping disruptions to a minimum, to organizing, analyzing, and displaying data. It is an intriguing problem that may revolutionize the bird real estate market but before the boom there are some real challenges that are both exciting and educational. This type of challenge keeps our JMU students abreast of the advances in technology and also provides innovative solutions to scientists in the field.

KEVIN GIOVANETTI  
 Professor of Physics and Astronomy



# Community Innovations: Addressing Human Trafficking



4 MAJORS

In the spring of 2020, professors from seven different disciplines mentored a class of 55 students as they developed solutions related to human trafficking, which exploits millions of people worldwide. The class worked in conjunction with the following client partners:

- Arc Aspicio
- Hart School faculty
- NewBridges Immigrant Resource Center
- New Creation
- Shared Hope International
- U.S. Department of Homeland Security

Despite the added challenges of the class moving online during the pandemic, multidisciplinary student teams devised a variety of solutions based on their client partners' needs. One team developed an internship program and resourced innovative ways of searching the internet for victims and perpetrators of child exploitation. Another team built a curriculum to educate hospitality program students so they can spot signs of human trafficking in their field. And another team established criteria to help determine which agencies that house children in recovery from human trafficking should receive funding.



## Medical Innovations

In this course, engineering, kinesiology, and nursing students work in multidisciplinary teams to develop and communicate solutions to a community health challenge such as the opioid crisis.

### Faculty

- STEPHANIE KURTI Kinesiology
- ERICA LEWIS Nursing
- PATRICE LUDWIG Biology
- JACQUELYN NAGEL Engineering



4 MAJORS

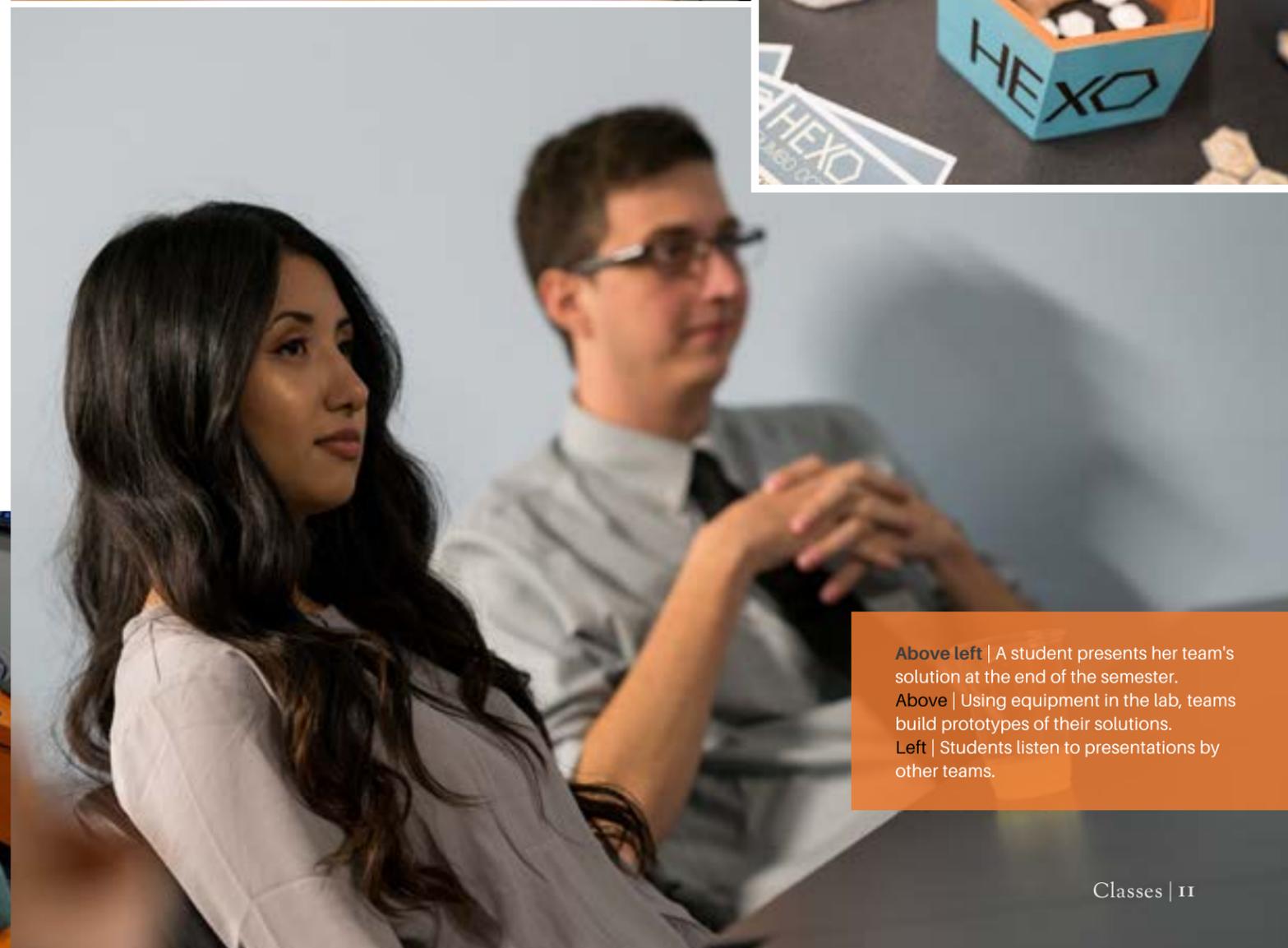


### Faculty

- ERICA LEWIS Nursing
- ICCHA BASNYAT Communication Studies
- CATHY COPELAND Writing, Rhetoric and Technical Communication
- RUTH O'ROURKE Hospitality
- KATHY OTT WALTER Health Sciences
- MADIHA PATEL WRTC Teaching Assistant
- TARA PARSONS Justice Studies
- DINESH SHARMA Mathematics & Statistics

“[The students] were able to find a way to help law enforcement with their process of tracking suspected human traffickers by analyzing a data set which was otherwise unusable.

DINESH SHARMA



**Above left** | A student presents her team's solution at the end of the semester.  
**Above** | Using equipment in the lab, teams build prototypes of their solutions.  
**Left** | Students listen to presentations by other teams.

**Above** | Image by goodfreephotos.com  
**Left** | Erica Lewis teaches a class.  
**Right** | Students work through an ideation exercise.

# Hacking for Defense (H4D)



In the spring of 2020, JMU X-Labs hosted its fourth H4D class, where transdisciplinary student teams pursued solutions to challenges based on the needs of client partners from the following organizations: the Defense Logistics Agency, the Defense Threat Reduction Agency, the U.S. Air Force, the U.S. Department of State, and the U.S. Army.

## Faculty

- CATHY COPELAND Writing, Rhetoric and Technical Communication
- STEVE HARPER Engineering
- JOHN HULSEY Political Science
- KATHLEEN MOORE Intelligence Analysis

“This class brings a unique opportunity to create military and industry connections. In its nature of having the problems provided from the industry or military partners, the students immediately build engaging connections with organizations that are providing services for real customers and the country.

STEVEN HARPER



Students, parents, faculty and administrators listen to a Hacking for Defense presentation at the spring JMU X-Labs Innovation Summit.

# Hacking for Diplomacy (H4D)



In the fall of 2019, student teams tackled global challenges from client partners including the Army National Guard, the Federal Emergency Management Agency (FEMA), the Joint Personnel Recovery Agency, the North Atlantic Treaty Organization (NATO), and the U.S. Department of State.

## Faculty

- BERNIE KAUSSLER Political Science
- COSTEL CONSTANTIN Physics & Astronomy
- CATHY COPELAND Writing, Rhetoric and Technical Communication
- MERT TOKMAN Marketing

Right | (Left to right) Joe Hunt, Kevin Peng, Riley Geiger, Bernie Kaussler, Rear Admiral R.P. "René" Tas, Tita Ferede, Olivia Brandt, and Tatum Elliot pose for a photo at a NATO conference in Virginia Beach. Below | Olivia Brandt presents to NATO officials in Virginia Beach with Kevin Peng, Tatum Elliot, and Joe Hunt.



“Hacking for Diplomacy isn't just any project- or discussion-oriented course. We are given the chance to not only make a difference in the well-being of the United States but contribute to the advancement of the world in general.

KEVIN PENG  
Economics Major  
International student from Taiwan

## NATO Project

After teams spent two semesters developing a decision-forcing tool, the NATO School Oberammergau in southern Germany aims to adopt the tool as part of their training program for officers.

For more on this story, go to <https://bit.ly/zWPiKqe> or scan the QR code.



# Featured RESEARCH



## Drone Cryptography

See page 16.

**Left | Ahmad Salman's** team takes their secure mobile data collection drone for a test flight.

# DRONE CRYPTOGRAPHY

Dr. Ahmad Salman and Dr. Will Diehl first met in 2014 when Diehl joined the Cryptographic Engineering



Research Group at GMU. Although they went their separate ways when Salman was hired by JMU and Diehl started working at Virginia Tech, a JMU article about Salman's drone project brought them back together.

"You know what we should do," Diehl said after reading the article, "we should put our public-key algorithm implementation on the drone to secure its signals." Salman liked the idea and they received funding through a 4-VA grant to collaborate on the project.

"The rapid growth of drone usage has created a need to secure the data they collect," said Salman, "especially for sensitive applications, such as military and industrial applications. The problem with public-key cryptography in particular is that they are computationally intensive protocols and if not implemented efficiently, they require a lot of power to perform computations. For battery powered devices such as drones and IoT devices, battery life is everything for practicality which means that any



cryptographic implementations need to be very efficient in terms of power and energy consumption. Creating lightweight cryptographic algorithms is a specialty of Will's and mine and we knew that we could make something good working together on this."

**Right | Ahmad Salman** adjusts a sensor to prepare the drone for its test flight.  
**Inset | Drone pilot Rob Levine** (sunglasses) prepares and flies the drone with the help of **Will Diehl** (white cap) and ISAT senior **Anaseli Marcos-Martinez** (sweatshirt).



*"Our project has opened new doors to this area of research as not too many open research studies have been conducted on securing drone signals and data."*

AHMAD SALMAN  
Assistant Professor of Integrated Science and Technology

# INNOVATION *in* The Netherlands



In August 2019, at the 41st Annual EAIR Forum at Leiden University in The Netherlands, Professors Ben Selznick and Nick Swayne

presented a paper about how innovation can change the whole nature of higher education. Written in collaboration with key JMU X-Labs faculty, their theoretically motivated and empirically supported conceptual model highlights three key factors—students, faculty and university administrators—in the context of institutional innovation toward the development of innovators.

**Right** | The 41st Annual EAIR Forum 2019 at Leiden University

**Below** | The Kamerlingh Onnes building is part of the Law School at Leiden University.

## The European Higher Education Society

The European Higher Education Society, known as EAIR, is a unique international association for higher education researchers, practitioners, students, managers and policy-makers. Established in 1979, EAIR is an association of experts and professionals interested in the relationship between research, policy and practice in higher education.



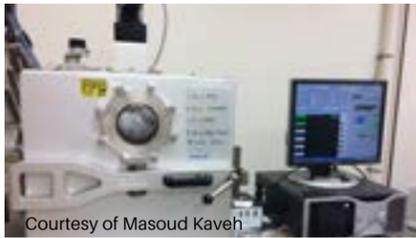
Photo by Nick Swayne



Photo by Nick Swayne

# Conducting

# COLLABORATIONS



An electron-beam deposition setup in the JMU clean room

Courtesy of Masoud Kaveh

In the summer of 2016, Masoud Kaveh interviewed with Chenggang Tao at Virginia Tech for a postdoc position in Tao's research group. Just a few days later, JMU offered Kaveh a position in the Department of Physics & Astronomy, which meant he had the best of both worlds. "It was perfect," Kaveh said, "Now I could have my own research lab and be close enough to Dr. Tao to take advantage of his collaboration and his knowledge. Since then we have been collaborating on different projects."

One of those projects was Kaveh's first 4-VA grant project, awarded in the spring of 2017, where Kaveh's team at JMU and Tao's team at Virginia Tech worked on an innovative design of semiconductor samples and metals that had never been studied before, researching how to use semiconductor nanowires to overcome limitations of metals in

transferring energy. As a result of the collaboration, they learned more about the science behind the interactions between metals and semiconductors and then applied that knowledge toward their second 4-VA project, awarded in the fall of 2018, to develop a new way of storing energy.

Kaveh has also been working on his 4-VA projects with one of the world's biggest names in the field of semiconductor nano structures—Chennupati Jagadish. Kaveh first met Jagadish in 2011 when Kaveh's Ph.D. thesis used samples fabricated by Jagadish. As a distinguished professor who has received many awards and accolades, Dr. Jagadish works with only a limited number of research groups from all around the world. "I am very lucky to have his support and collaboration as a young faculty here at JMU," said

Kaveh, "It is a perfect way of engaging JMU with cutting edge research in physics, engaging with the world and new ideas!"

Kaveh's team has published several papers and presented at various conferences around the country. "I just want to thank the 4-VA team one more time for all their hard work and support," Kaveh said, "Thanks to the seed money provided by 4-VA, we have been able to move our project forward, publish and present our work and have our students get another level of education. Through this support our project got on the final list of the Madison Trust award this year. Also, this project was chosen by the Office of Sponsored Programs to present JMU at this year's round of competitions for Jeffress Trust Awards."

"Watching our undergraduate students growing and becoming professional, confident researchers is a priceless experience I have had through these projects during the past few years.

*I'll never forget when Nikolas Roeske, a freshman physics major joined my group. He was very shy but motivated. Just a couple of years later, he presented our research at the Virginia Soft Matter Workshop, in the fall of 2018 at VT, among other faculty and post doctorate presenters. He did such a great job that during the break in that meeting, other faculty were asking me whether he was really an undergraduate student. I was so proud of him.*

MASOUD KAVEH

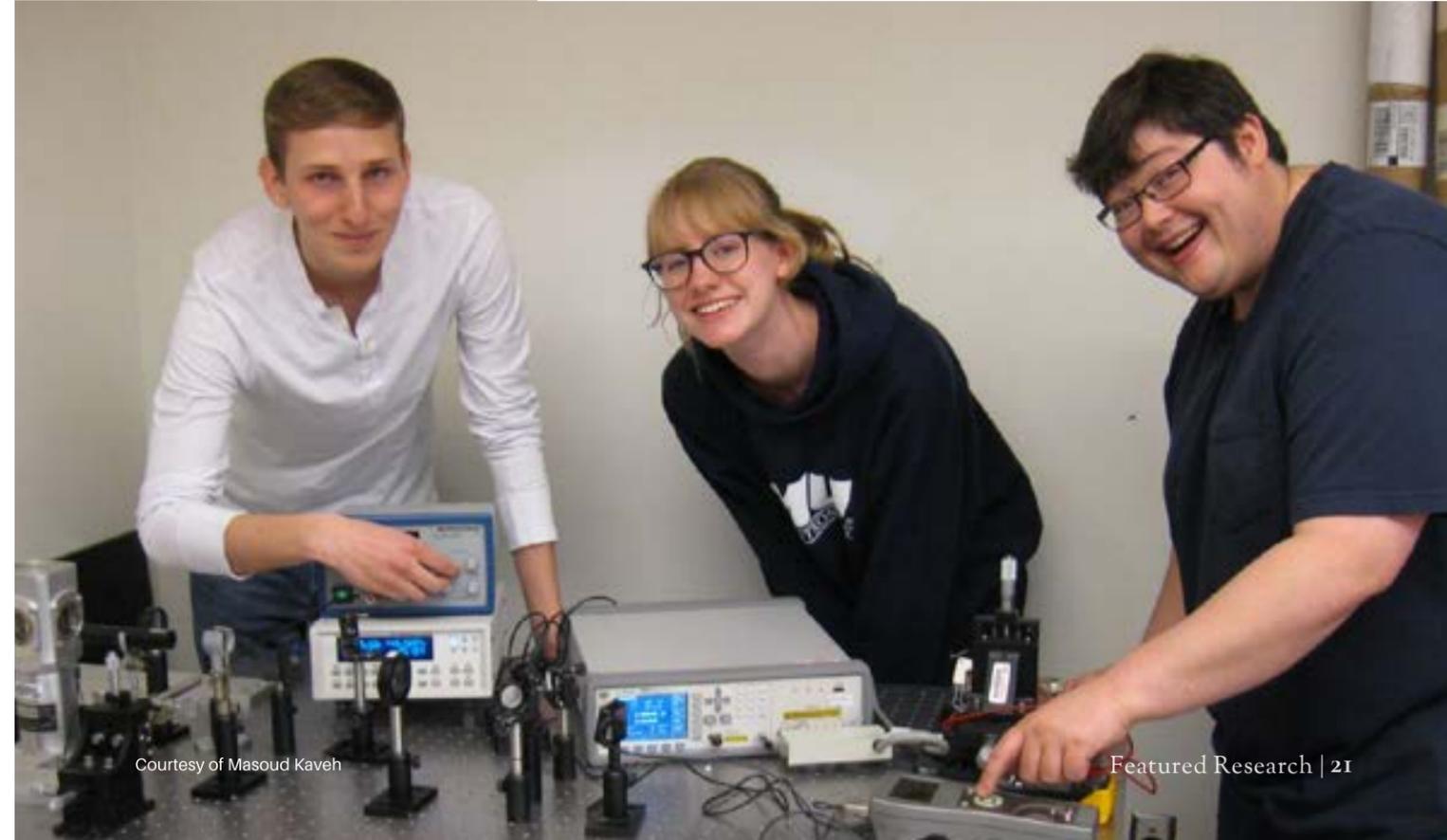


Right | (Left to right) Kaveh and students Josh Mitri, Maeven Luedke, and Nikolas Roeske stand ready in the clean room. Below | Nikolas Roeske, Maeven Luedke, and Josh Mitri are at work in the optics lab.

Courtesy of Masoud Kaveh



Former Provost Jerry Benson and President Jonathan Alger present Kaveh with his first 4-VA grant award in 2017.



Courtesy of Masoud Kaveh

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# Redesigning EVENTS

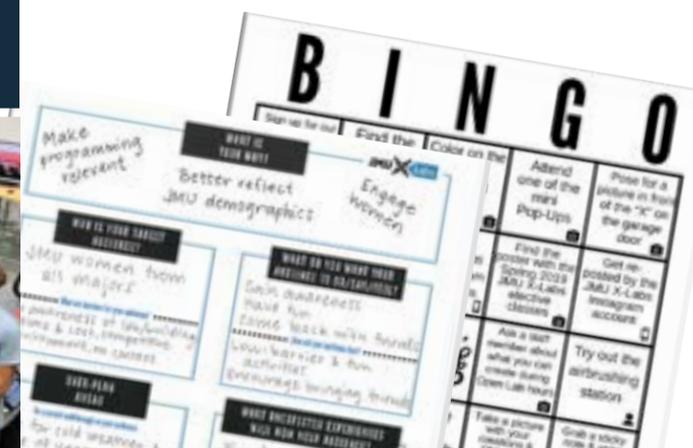


**Below** | Students use etching cream on stencils made with a vinyl cutter to create unique designs on glass.

## to Empower WOMEN



## Before



**Left** | The 2017 Bluestone Hacks event consisted of 90+ primarily male STEM majors. **Above** | Asking questions to understand the target audience led to activities like Bingo, which helped students connect with JMU X-Labs resources. **Below** | After the redesign effort, the first Fab Lab event brought more than 250 mostly female students from more than 50 different majors.

## After



In 2017, the administrative staff at JMU X-Labs wondered why one of its events, which successfully attracted 90+ participants, was made up of mostly male STEM majors. In an attempt to better represent JMU demographics, they came up with a formula for redesigning their programs to appeal to and empower women from the whole spectrum of majors at JMU in an event called Fab Lab (page 38). A year later, the maximum capacity of 250 participants—most of

whom were female—attended the new event from nearly every major offered at JMU. With such significant results, the staff—Kelsey Hartman, Emily Winter, and Kim Fisher—submitted a proposal about their process and were accepted to present at the 2019 Feminisms & Rhetorics Conference in Harrisonburg, Virginia.



*Redesigning Events to Empower Women* was one of 30 how-to workshops at the Feminisms and Rhetorics 2019 Conference, which boasted 478 attendees from more than 200 universities and 46 states across the country.

# From Montpelier TO ATHENS



**Kotroni** is known in antiquity as Aphidna. It was one of the original 12 districts of Classical Athens brought together in synecism by its legendary founder, Cecrops.

In 2018, Assistant Professor of Geology & Environmental Science Shane McGary received a 4-VA grant for a project called “Advanced geospatial techniques in archaeological teaching and research” in collaboration with UVA. In the spring of 2020, McGary taught a shared field geophysics course with UVA, which included non-invasive archaeological work at James Madison’s Montpelier to give them a better sense of the targets for geophysics. Once they know the targets, the archaeology team plans to travel to Greece where UVA has a partnership with the University of Athens for excavations at Kotroni (the likely site of

ancient Aphidna) for a multi-year archaeological reconnaissance survey. Before they go to Greece, the team needs to determine which methods are most applicable in Greek soil. For example, if they decided to use some combination of ground-penetrating radar and magnetics, the original plan was to aim for a trip during the summer of 2020, and if resistivity looked to be an important part of the package, they had planned to go in the fall because ground moisture would have a significant impact on results.

However, because of travel and social distancing restrictions following the outbreak of the COVID-19



pandemic, the team has delayed the trip to Greece until it’s safe to travel.

When that time comes, they will work with a team of archaeologists in Greece using the data from JMU to inform the excavation, which will help them maximize results while minimizing impact on the site.

The lead student is Emily Marsch, a sophomore geology major with archaeology and geophysics minors, who will be using the project as her honors research project, and two other students selected from the course will join McGary and Marsch on the trip.



Photo by Ron Cogswell

**Left | Montpelier** is the team’s primary test site to prepare for Athens.

**Right | Sara Patton and Savhanna Long** spot part of a foundation of the main dwelling house while collecting ground-penetrating radar in February 2020.

**Below |** From top left: **Zach McKeeby, Brian Pfeifer, Thomas Loughlin, Shane McGary, Sean Christian, Savhanna Long, Sara Patton, Emily Marsch, Molly Tenerelli**



Photo by Shane McGary



Courtesy of Shane McGary



Former Provost **Jerry Benson** and President **Jonathan Alger** present **Mabrey** and **Cunningham** with a 4-VA grant award in 2016.



**Left | Liv Stephens** checks people in at the registration table for the Debate for Civic Learning Institute.

# Debate for CIVIC ENGAGEMENT

About 10 years ago, JMU Director of Debate Mike Davis and Assistant Director of Debate Paul Mabrey\* submitted a quality enhancement plan to JMU for including debate across the curriculum. Although it wasn't selected at the time, Davis and Mabrey knew they were onto something and continued to develop their idea. They created a program and recruited faculty associates to work on the project and now, a decade later, Debate Across the Curriculum is an official initiative that has worked with over 50 faculty from every college at JMU to insert debate into hundreds of classes, including a leadership class taught by President Alger.

The concept has caught on in many ways, and they even teach a Debate Across the Curriculum workshop through the Center for Faculty Innovation. It was at one of these

workshops in 2016 that Beth Cunningham, who was teaching for Educational Foundations and Exceptionalities, decided to collaborate with Mabrey, and they were awarded a 4-VA grant. In preparation for the project, Cunningham helped make connections with faculty at other institutions, including George Mason University and Longwood University, to integrate debate-based pedagogy into expectational education curriculum, all of which helped prepare Mabrey and Davis for a second 4-VA grant.

"A desire to increase the impact of Debate Across the Curriculum led us to reach out to colleagues from multiple universities who we knew were committed to civic discourse in the same ways we were," said Davis. "They enthusiastically joined on and now students from across a wide variety of institutions will benefit from this intensive

\*Mike Davis now serves as the executive advisor to the president and Paul Mabrey is the coordinator for the Communication Center and an assistant professor in the School of Communication Studies.

training. The first of those partners was Virginia Commonwealth when a chance meeting led to a fruitful partnership between us and Lynn Pelco, the associate vice provost of community engagement."

The project continues to thrive and grow as they connect with more partners and participants, including K-12 schools across Virginia and iDebate Rwanda in Africa.

In 2020, the team was awarded a Colonial Academic Alliance (CAA) Innovate/Collaborate Grant of \$40,000, which enables them to collaborate with colleges across the CAA over the next two years to focus on using debate-based pedagogy for civic learning.

*"We have gathered data across classes, disciplines, and institutions that suggest a significant impact of participating in debate-based activities on student civic learning. In particular students have responded that their participation in different simulations and role-playing activities has helped their problem-solving, listening, empathy, and communication about controversial and difficult issues."*

PAUL MABREY

**Right | Mabrey** presents at the Debate for Civic Learning Institute. **Below |** (Left to right) **Lynn Pelco, Dingani Mthethwa, Michael Pyles, Emily Peron, Tammy Swecker, Michael Rackett, Susan Bodnar-Deren, and Paul Mabrey** all presented at the Debate for Civic Learning Institute. All except for Paul Mabrey are from VCU.





# CURE-All

This biology course redesign was so successful, the team was awarded a \$1.97 million grant to expand it.

“ During the summer of 2016, we used 4-VA funding to support a Biology faculty working group tasked with the redesign of the entire first year Bio core curriculum. The DNA Barcoding lab content that we chose to implement into the courses grew out of a previously established collaboration with researchers and educators at the Cold Spring Harbor Laboratory DNA Learning Center (DNALC) in New York. The collaboration with the DNALC was extremely helpful as we developed and implemented the course-based undergraduate research experience (CURE) here at JMU. They were able to give us a ton of technical support and in turn, we became one of the biggest users of their educational bioinformatics platform, DNA Subway. During the 2016-17

academic year, after our large-scale implementation of the DNA Barcoding CURE, CGEMS began focusing a portion of our annual summer bioinformatics workshops—which were also supported by 4-VA—on DNA Barcoding using the DNA Subway bioinformatics tools developed by the DNALC. This is really what planted the seed for the idea to spread the JMU DNA Barcoding CURE model using DNALC-developed bioinformatics tools to other educators around the country. That is essentially the core aim of the NSF IUSE grant, to further develop our barcoding CURE courses here at JMU and help other undergraduate educators around the U.S. learn and implement similar versions at their home institutions.

RAY ENKE  
Associate Professor of Biology

450+ Documented local species of plants, fungi and invertebrates

1,500+ Unique barcode sequences



Photo by Zack Noftsinger

“ Our current NSF IUSE grant is a continuation of the project 4-VA originally supported back in the summer of 2016 when Biology began revising our 1st year curriculum. We’ve tried to keep the momentum going and are incredibly appreciative of the support from 4-VA over the years.

RAY ENKE  
Associate Professor of Biology



Left | DNA barcoding workshop participants collect samples from the arboretum at JMU. Below | Ray Enke (Back row, 4th from left) and Oliver Hyman (Front row, 3rd from left) received \$1,973,924 from the NSF to collaborate with their Co-PIs at the Cold Spring Harbor Laboratory DNA Learning Center to support broad implementation of CUREs into large enrollment undergraduate core curriculum courses in an effort to increase student retention and graduation rates in STEM majors.



Photo by Zack Noftsinger

DNA barcoding workshop participants extract DNA from samples they collected from the Edith J. Carrier Arboretum at JMU. Participants will take these skills back to their home institutions.

In response to a nationwide need to enhance introductory biology curricula, and with funding from 4-VA, the JMU Department of Biology built a cost-effective, scalable, and transferable 14-week course-based undergraduate research experience (CURE) designed for large enrollment introductory biology labs. Since its implementation at JMU in 2016, the 6,000+ students who have completed these labs have created and shared over 1,500 unique DNA barcode sequences and documented over 450 local species of plants, fungi, and invertebrates, making it among the largest-enrollment CUREs offered to first-year undergraduates in the United

States. These labs were featured in *The Chronicle of Higher Education* and are available on the CourseSource website for other institutions interested in documenting biodiversity and engaging introductory biology students in authentic research. JMU biology faculty Dr. Oliver Hyman and Dr. Ray Enke, in collaboration with researchers at the Cold Spring Harbor Laboratory DNA Learning Center, are currently disseminating these lab materials through a series of national workshops funded by the National Science Foundation’s (NSF) Improving Undergraduate STEM Education (IUSE) funding mechanism.



Photo by Zack Noftsinger

# Million Dollar GRANT

In 2017 and 2018, 4-VA awarded grants to George Vidal and his team to work with UVA on the genetics of neurodevelopmental differences that cause autism and schizophrenia. This support helped them demonstrate their capacity to deliver exceptional research results and led to a \$1,053,000 grant from the National Institutes of Health in 2020, the largest research grant the agency has ever given to a single scientist at JMU. Vidal will use the grant to research the function of an autism risk gene in the developing brain.



**Below right** | Biology major Eden Widener prepares a mouse brain for histological analysis with guidance from Vidal. **Below left** | Vidal prepares to introduce DNA into the developing brain of a mouse embryo.



“Thanks to 4-VA support of my scholarship and my JMU undergraduate research team, I was awarded a Faculty Development Award to Promote Diversity in Neuroscience Research by the National Institutes of Health. The support really gave my lab the initial boost we needed to successfully compete for this award!”

GEORGE VIDAL  
Assistant Professor of Biology

# DIABETES SYMPOSIUM Shifts Online



In the fall of 2019, 4-VA awarded Lori Beth De Hertogh a grant to develop and host a statewide symposium on diabetes with her team, but little did anyone know that a global pandemic would suddenly change their course. Originally scheduled for June, the symposium will now be held online in November of 2020.

“I am really proud of our team—as soon as things started to change due to COVID, we immediately came together to figure out a way to host the Symposium and to meet the needs of attendees. We were determined to not give up on this opportunity because so many people with diabetes in our state need care and support.”

LORI BETH DE HERTOGH  
Assistant Professor of Writing, Rhetoric and Technical Communication

“The original focus of the Symposium was on bringing together medical humanities faculty and students, diabetes educators, healthcare professionals and health profession students, and community members from western and central Virginia to develop interdisciplinary research initiatives around diabetes care in the state. The idea is that we didn't know what the research initiative was going to be headed into the Symposium, but that we would identify that research trajectory/need collectively.”

When the pandemic happened and so much healthcare suddenly shifted into the sphere of telemedicine, we realized that this mode of healthcare was where our research and collaborative energies needed to go. Even after the pandemic is over, we will all certainly continue to see a trend toward telemedicine for diabetes care as well as for a range of other health needs. So focusing on telemedicine seemed like a

prudent shift because it recognizes not only where we find ourselves now, but where we're headed in the future. At first we discussed the possibility of trying to host the Symposium in person, but then we realized we'd be devoting a lot of energy to maintaining social distancing and less time actually talking about ideas for how to improve diabetes care in Virginia. So it made sense to shift online because we can still have dynamic, rich conversations about diabetes care in the state, while not having to worry about participants' health and safety. We understand that there could be technological barriers for some Symposium participants, and we're currently working on how to address those potential barriers to increase access.

LORI BETH DE HERTOGH  
Assistant Professor of Writing, Rhetoric and Technical Communication

## Symposium Organizers



CYNTHIA MARTIN  
JMU Instructor of Writing, Rhetoric and Technical Communication



JULIE PIERANTONI  
Registered Nurse at Sentara RMH Medical Center



DAVE DIXON  
VCU Associate Professor of Ambulatory Care



TERESA SALGADO  
VCU Assistant Professor of Pharmacotherapy & Outcomes Science



EVAN SISSON  
VCU Associate Professor of Pharmacy

# EVENTS

## By the numbers

JMU X-Labs staff members organize events that promote scholarship across campus, outreach in the community, and engagement with students from all disciplines.

JMU X-Labs also offers a variety of make-and-take workshops that provide low-barrier access to students, introducing them to design thinking and supporting their creative and innovative ideas and solutions.

- 1787 August Orientation for freshmen
- Admissions events
- CHOICES tours for prospective students
- Departmental workshops
- Education workshops
- Fab Lab
- Family Game Night
- Open Lab
- Pop-Ups
- Talent Development workshops
- Valley Business Keynote sponsorship

5

Administrative Staff Members

8

Student Interns

50+

Events

\*3,700+

Participants



PANDEMIC MENTION  
COVID-19

\*JMU closed its campus in March of 2020 due to the COVID-19 pandemic, so these numbers reflect an abbreviated academic year.

*“JMU X-Labs is THE coolest resource on campus!”*

ALIX TENORIO  
Integrated Science and Technology

JMU X-Labs classrooms and events are located in Lakeview Hall next to Newman Lake.



ORIENTATION **1787**

Every year incoming freshmen have the opportunity to explore JMU and all it has to offer during the 1787 Weeks of Welcome and August Orientation. For its second year in a row, JMU X-Labs participated in 1787 by introducing students to the lab with fun activities and make-and-take things to use in their new dorms, houses, and apartments:

- Bingo helps them get to know the lab
- Cork-board calendars
- Laser-cut message boards to hang on doors
- Magnets
- Painted door stops
- Scavenger hunts
- Swag, such as tote bags and stickers

August **ORIENTATION**  341 Participants



**1787**  
 Named in honor of the year 1787 when James Madison and the other Founding Fathers wrote the U.S. Constitution, the 1787 August Orientation helps freshmen transition to college life by connecting with the JMU community in fun and engaging ways.



**Photos** | Incoming freshmen make doorstops, message boards, and cork-board calendars while making friends in the lab at JMU X-Labs.



# Campus ENGAGEMENT



JMU Orientation Fiscal and Administrative Manager **DaNae Peterson** paints a laser-cut luggage tag she designed in the lab.



## Campus-wide Events

**Above** | During **Family Weekend**, students and their families explored the lab, engaged with the technology, played trivia, and made their own JMU swag.



## Departmental Workshops

**Below** | In October 2019, the **JMU Orientation** team made vinyl-cut cork board calendars, personalized white boards and spirited magnets as part of their team-building and training.



## Admissions Events

**Below** | A prospective student and her parent visit JMU X-Labs during the winter **CHOICES** event.



# Fab Lab 2020

“ I love JMU X-Labs and all the programs they offer. They are a creative outlet and provide great experiences both creatively and academically.

MELODY BARGER



JMU X-Labs held its third annual event for women—Fab Lab—in January 2020. Large-scale events like Fab Lab provide an entry point into the lab's innovation ecosystem: introducing students to resources, connecting them with people from other disciplines, and helping them develop their ideas in new ways.

Continued on page 40.

Pictured | Fab Lab filled the lab at Lakeview Hall with more than 150 people, 53% of whom had never been to JMU X-Labs before.



Fab Lab



Left | Mark Powell of Air Illusions shows a student how to use an airbrush to paint a design on a cookie.

4 Community partnerships



Left | An airbrushed cookie Below | A student makes her mark on the scratch-art wings that lined the hall.



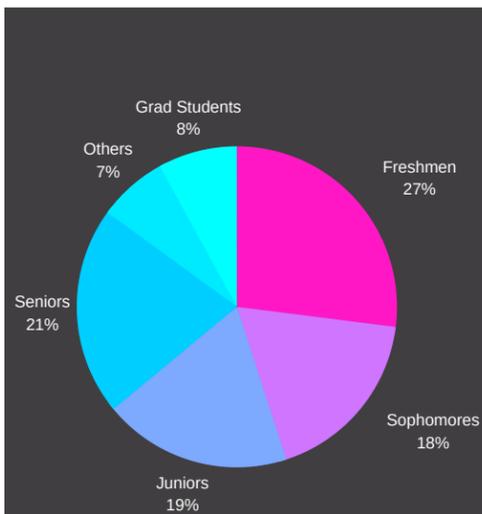
Top & Right | Participants design and make dream-catchers. Above | SKS Artworks teaches henna design. Left | A student applies glass-etching cream to a jar.



155 Participants

82 First timers

Left | Students experiment with the virtual reality equipment at Fab Lab.



45 Different majors represented

## Technology Used

- Airbrush tool
- Button press
- 86" Dell Touch Interactive Monitors
- Laser cutter
- Vinyl cutter
- Virtual reality



# Family GAME NIGHT



**Above** | Air Illusions used airbrushing to give family members temporary tattoos during the event.



**Left** | A student and her family prepare to paint their laser-cut design.  
**Above** | A family team has fun with a trivia question about JMU.

In October of 2019, JMU X-Labs hosted its first Family Game Night during JMU's Family Weekend. In partnership with the Office of Parent Relations, JMU X-Labs offered activities that included a make-and-take for each participant, laser cut puzzles, JMU trivia, giant laser-cut games like checkers and tic-tac-toe, interactive touch screen games, magnet making and more.

The event provided a great opportunity for students and their families to have fun together while learning about the equipment and services offered at JMU X-Labs.

- Activities**
- Airbrush tattoos
  - Giant games
    - Checkers
    - Dominoes
    - Jenga
    - Tic-tac-toe
  - Interactive touch screen games
  - JMU trivia
  - Laser-cut puzzle making
  - Magnet making

**60** Participants

**Above** | A JMU student works on a giant digital jigsaw puzzle with her parents at Family and Friends Game Night in The Tank classroom.  
**Below** | Breeze TV interviews Madison Carrillo and Miranda Landmann.



*Featured on Breeze TV!*



The family that won JMU trivia was awarded a laser-cut sign with their family name.

# Open LAB

58/58  
Majors

2,200+  
Participants\*

3,000+  
Projects\*



**Above** | Once trained, or with the help of a staff member, students can use the laser cutter to bring their designs to life during Open Lab. **Below Left** | Three students (@h.phenomenon, @bai1ey, and @jackie.kossey) won the Open Lab Projects halloween costume contest with the t-shirts they made. **Below Right** | Another student won the Open Lab Projects holiday gift contest by making a laser-cut engagement ring box.

## Open Lab Projects

This year JMU X-Labs debuted Open Lab Projects, a program that gives students ideas about what they can make in the lab using a different theme each month. The interns displayed examples of things to make each month, such as shirts, buttons, hats, and bags with logos for 'student org' month. Students also had a chance to win a prize and be featured on Instagram by submitting their own projects.

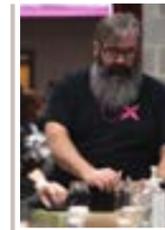


\*These numbers reflect the 2019-2020 academic year up until the lab closed on March 16, 2020 due to the COVID-19 pandemic.



As a result of building an ecosystem of innovation in action, students want to get involved, and they actively look for ways to participate in JMU X-Labs programs. Open Lab provides a system of support for students to work on their own projects, learn how to use the equipment, explore new ideas, and build confidence in themselves and their abilities. Aaron Kishbaugh serves as the JMU X-Labs lab manager and uses his extensive experience in innovation and design to help students refine their concepts.

"Aaron has helped me work on so, so many things in the lab," says student intern Emily Marsch. "He taught me how to use all the machinery when I first started at JMU X-Labs. More recently, he's been



**Above & Left** | Lab Manager Aaron Kishbaugh helps students build out their ideas in the lab.

helping me learn how to program, wire, and solder LEDs for our Light Up Christmas Sweater Pop-Up."

Students from every major use the lab as a resource to collaborate on projects. A music major, for example, worked with Kishbaugh in the lab and used the laser cutter and other tools to create an interactive music experience for a display at the Valley Mall.

During Open Lab, equipment and supplies are available to students, faculty, and staff and common projects include laser cutting, glass etching, soldering, sticker making, button making, virtual reality, and LED programming, all of which provide low barrier access to our ecosystem of innovation.



**Below & Right** | Students from various majors who belong to the JMU Colorguard designed and laser cut the wrenches used in JMU Nuance's production of Under the Hood! with help from JMU X-Labs.



PANDEMIC MENTION  
COVID-19

# POP-UPS

**Below** | A student who attended the International Week Pop-Up made her own cork memory board and laser-engraved luggage tag. The workshop was taught in partnership with the Center for Global Engagement.



**Above** | A student makes a calendar at the Friends of Rachel Club Advent Calendar Pop-Up



**Left** | A student applies etching cream to a glass using her vinyl-cut design.  
**Above** | Students showcase the products they designed during the Love Your Pet Week Pop-Up.

Pop-Ups are free, non-credit workshops for JMU students and faculty. Taught by JMU X-Labs students, staff, and community experts, these make-and-take classes are an opportunity to try a new skill, practice using equipment, and have fun during the process. Pop-Ups reach up to 90 students a week from all majors and offer low-barrier access to making and design thinking, which helps them generate creative and innovative ideas and solutions.

Activities and make-and-take items range from glass-etched gifts to making scrunchies, laser-engraved friendship bracelets, hats, and custom socks, as well as sewing, heat-

transfer vinyl, DIY t-shirts, and LED holiday sweaters. Many Pop-Ups are taught in partnership with local businesses (page 48) to connect JMU with the local community, build relationships, and provide access to new ways of thinking and making.

In response to the COVID-19 pandemic, JMU X-Labs student interns shifted focus at the end of the spring 2020 semester and began hosting a podcast (page 72) to help the JMU community stay connected. They are also in the process of developing concepts for virtual Pop-Ups for the fall of 2020 in the event that in-person Pop-Ups aren't possible.



**“Definitely one of my favorite places on campus!”**

JMU X-Labs has allowed me to unleash and showcase my inner creativity and puts me in a great mental headspace! The staff at the lab is very kind and helpful with making sure that everyone leaves beyond satisfied.

COLE LINDSEY



1,421  
Participants



58  
All JMU majors  
represented



Students display their vinyl-cut designs during the Outdoors Pop-Up.

# POP-UPS with PARTNERS

In addition to designing and developing Pop-Up workshops, JMU X-Labs student interns also reach out to local business owners and organizations in pursuit of partnerships that connect students with unique entrepreneurial and creative experiences. This year JMU X-Labs partnered with the following companies and organizations:

*Students learn from local business owners*

- Air Illusions
- Apalache Chocolate
- Center for Global Engagement
- Environmental Management Club
- Ethos
- Friends of Rachel Club
- Her Campus
- Madithon
- A Moment of Magic
- Shirley's Gourmet Popcorn



## PANDEMIC MENTION COVID-19

Because of the coronavirus pandemic, we weren't able to host Pop-Ups with the following organizations, but we look forward to working with them in the future!

- Armwrestling Club
- Bring Your Own, LLC
- Cedar Stone Spa
- JMU Bookstore
- Maristella Mission
- UREC



Right | Lisa Roeschley, co-owner of Shirley's Gourmet Popcorn, teaches students how to enhance popcorn flavor.  
Inset | Participants watch as Matthew Sibley from Apalache Chocolate demonstrates how to make artisan chocolates by hand.



“ I was impressed with how collaborative the pop-up was —people were SO engaged with the activity! Students/community members got the chance to make some of their most popular popcorn in groups, and got to take as many bags as they could carry home!

MIRANDA LANDMANN  
JMU X-Labs Student Intern

# Featured OUTCOMES



## VIRTUAL VISITORS JMU Board of Visitors Goes Virtual

See page 52.

Left | Board of Visitors Member **Maria Jankowski** experiences the VR tour under the guidance of **Katherine Manalo**, one of the students who created the tour.



# VIRTUAL VISITORS

“ Though I know virtual reality is not new, my “trip” to various JMU classrooms and other locations on campus was my VERY FIRST experience with VR. What a smart and practical way to use this technology to allow students, prospects, and parents to experience the JMU we love and want to share.

DEBORAH TOMPKINS JOHNSON  
Regional Policy Director, Dominion Resources

*Board of Visitors  
experience student-  
built Admissions  
campus tour*

In November 2019, SMAD major Katherine Manalo, CIS major Thomas Knupp, and Augmented/Virtual Reality Instructor James Barnes brought the official JMU

Admissions virtual reality (VR) tour of campus to the Board of Visitors meeting to let board members give it a try. The VR tour and its mobile companion were both designed, developed, and created by JMU X-Labs students.



Left | JMU Board of Visitors Member **Deborah Tompkins Johnson** virtually tours the campus with the help of **Thomas Knupp**, one of the students who helped create the tour.

Inset | JMU Board of Visitors Member **Maribeth Herod** uses the controller to select a different location across campus with the help of **Katherine Manalo**, who also helped develop the program.

“ The admissions goggles provided a really unique way to experience the university! Being able to experience a concert, walk through a dorm, or attend a class was outstanding. It provided an experience covering the spectrum of things on campus. The 360 degree view was outstanding. I could have played with it all day!

MARIBETH HEROD  
Rector of the Board of Visitors  
Senior Vice President of Bank of America

# A GROWING 4-VA Program



The College of William & Mary has developed programs of study in Data Science,

Virginia Military Institute and the College of William & Mary make 4-VA eight-schools strong

On September 9, 2019, 4-VA formally accepted Virginia Military Institute (VMI) and the College of

William & Mary (WM) as the newest 4-VA partner institutions, with Dean Kershaw from VMI and Margaret Saha from WM serving as the campus coordinators. Each university brings unique and exceptional strengths to the program that

will expand its collaborative reach across the commonwealth.

VMI and WM join George Mason University, James Madison University, Old Dominion University, the University of Virginia, Virginia Commonwealth University and Virginia Tech in leveraging the strengths of each partner university and improving efficiencies in higher education across the Commonwealth of Virginia.

**Left** | Virginia Military Institute is a public military college in Lexington. It was founded in 1839 and is the first public Senior Military College in the United States. - Wikipedia

**Right** | The College of William & Mary is a public research university in Williamsburg. Founded in 1693, it is the second-oldest institution of higher education in the United States. - Wikipedia



As a public liberal arts college operating in a unique military environment, Virginia Military Institute offers distinctive perspectives and opportunities in engineering, natural science, social science, and the humanities.

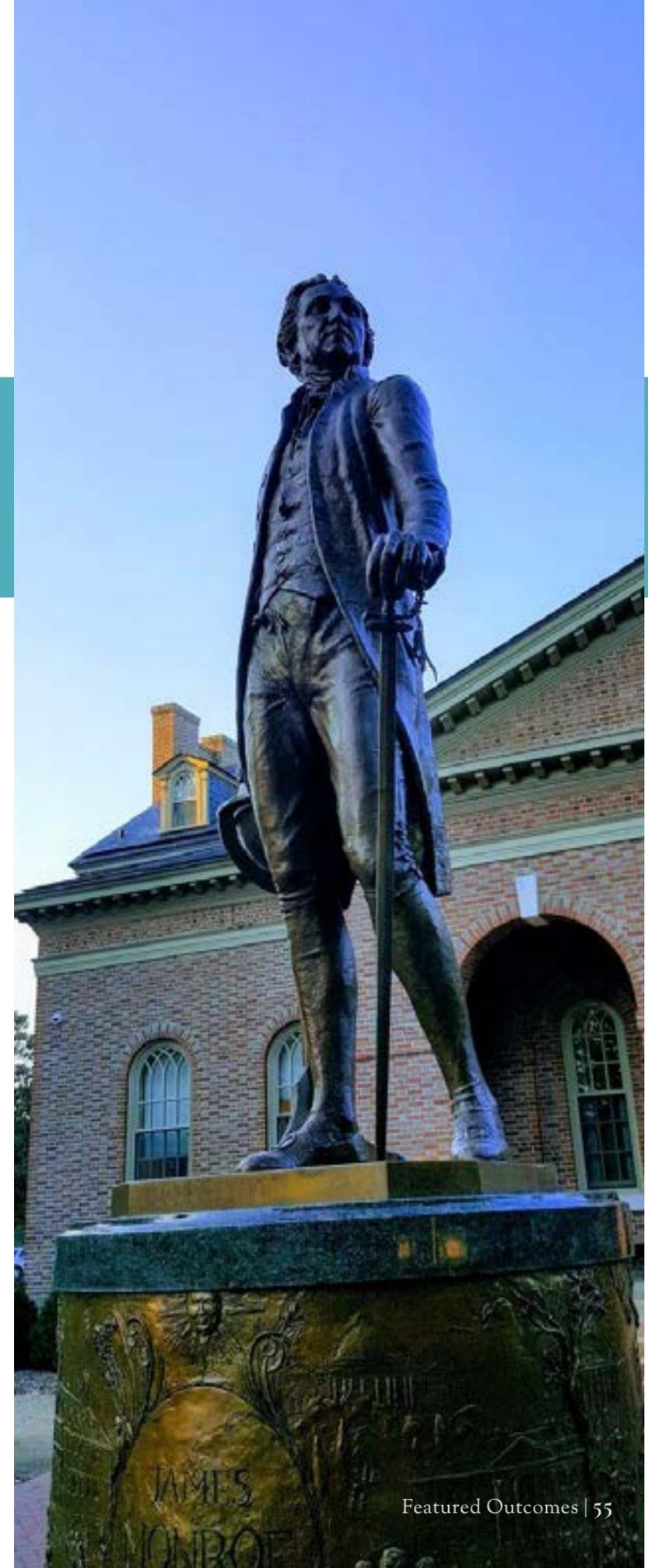
VMI's emphasis on leadership development challenges cadets and mentors to master working in multidisciplinary teams to solve real world problems. They have developed a

framework for cadets from engineering, computer science, and business to work collaboratively on senior capstone projects. Overseen by faculty from these disciplines, business students who write a business plan for their capstones are now engaged with students developing tangible products, while engineering and science students are reimagining their capstones with an eye toward innovation and entrepreneurship. In addition, VMI has collaborative relationships with outside research organizations, including the Naval Surface Warfare Center—Dahlgren Division, and the Johns Hopkins Applied Physics Laboratory.

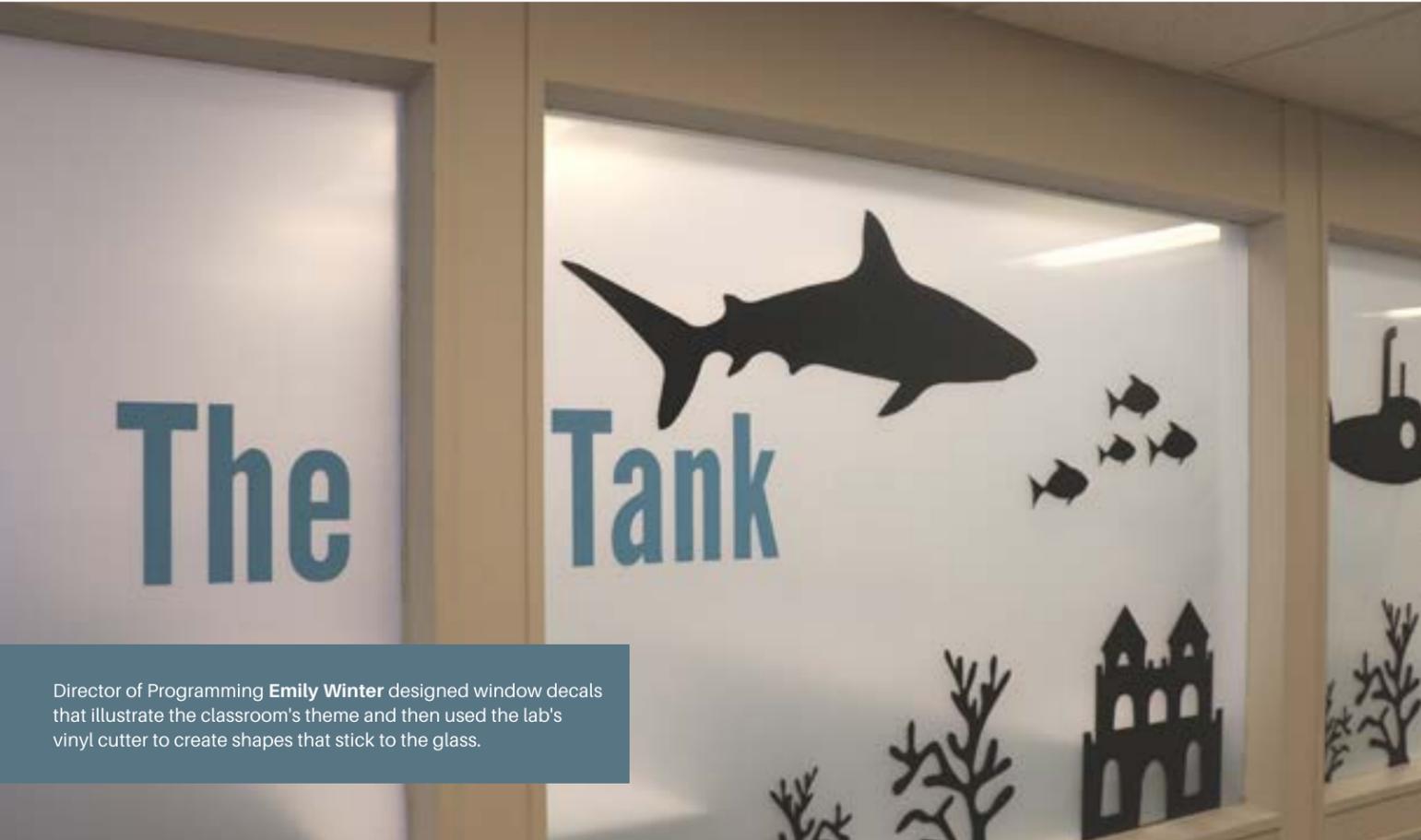
Engineering Physics and Applied Design, and Innovation and Entrepreneurship, all of which are growing rapidly and require intense interdisciplinary collaboration in classrooms, labs, and field studies. Their e-learning initiatives and the newly-established Studio for Teaching and Learning assist students in remote learning and online classes provide flexibility to degree-seeking undergraduates and professional students.

As a member of the Virginia Space Grant Consortium, they have received more than \$1.5 million in scholarships, fellowships, and research support for their students and faculty. They belong to the Virginia Microelectronics Consortium, which has provided core support for numerous programs in condensed matter, device physics, and for materials science faculty and students, leading to a large number of externally funded research grants and contracts. In addition, they offer a robust partnership with the Jefferson Labs and its affiliated schools.

William & Mary has an excellent student degree completion rate—95% of entering students continue to the second year. They also have long-standing articulation agreements with the Community College System in Virginia, and they work in close partnership with Richard Bland College.



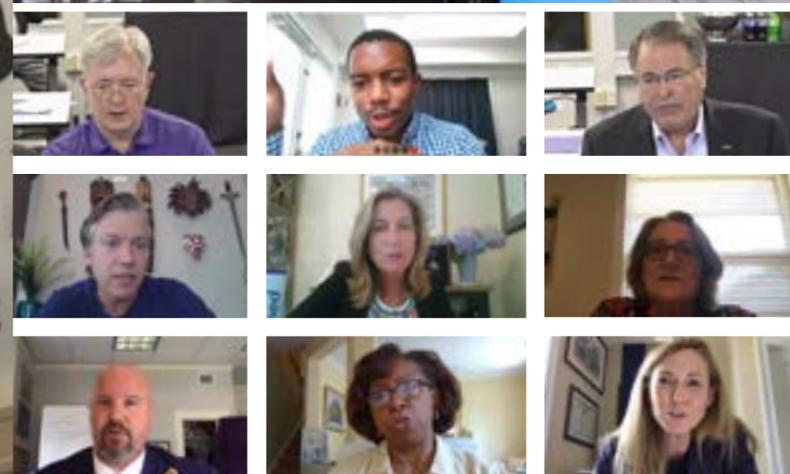
# THE TANK | Grand Opening



Director of Programming **Emily Winter** designed window decals that illustrate the classroom's theme and then used the lab's vinyl cutter to create shapes that stick to the glass.



**Top Left** | Training Manager **John Quinn** demonstrates how to use the collaborative Bluescape workspace in The Tank in February. **Top Right** | Students at Fab Lab 2020 explore virtual reality in the Tank. **Bottom Left & Right** | Since the stay-at-home order began, JMU senior administration and the JMU Board of Visitors (BOV) have been using spaces at JMU X-Labs to meet while maintaining social distancing guidelines or via Webex.



In 2019, there was a growing demand for additional JMU X-Labs programs, and the team was looking for opportunities to expand their space beyond the existing three Lakeview Hall classrooms.

“The only other option was a room across from the lab that was being used by WVPT for storage and as a server room,” said Executive Director Nick Swayne. “So we reached out for institutional support [to use it] and we were fortunate enough to get it. We couldn’t have done it without Senior Vice President of Administration and Finance Charlie King and Assistant Vice President of Information Technology Dale Hulvey.”

Once the team had administrative approval to make the room into a new classroom, Dell provided five large Touch

Interactive monitors, which are now all equipped with Bluescape software—a beautiful virtual collaborative workspace. Each table in the space is covered with a whiteboard coating so students can write on them with dry erase markers and flip them upright for better visibility. In addition, all of the tables, monitors, and chairs are mobile so they can be reconfigured for a variety of different use cases, including classes, workshops, and events.

Flanked on two sides by large, rectangular windows that give it the feel of an enormous aquarium, the room was dubbed “The Tank.” When it was finished, just before the spring of 2020, The Tank doubled the capacity for courses offered in the evenings.

By February 2020, The Tank had already been used to increase capacity for events like JMU Family Weekend and Fab Lab 2020, and was in regular use as a classroom for the Hacking for Defense and Robotic Process Automation classes.

In February, a team from Bluescape in California visited Lakeview Hall to train administrative staff and faculty in their versatile software. Little did anyone know that this online program and the telepresence technology in The Tank had arrived just in the nick of time.

A month later, the COVID-19 pandemic required that students, faculty and staff all work from home. Bluescape became an invaluable tool for staff to continue working on

visual collaboration projects, and the telepresence capabilities were suddenly a precious commodity across campus. Most notably, the university’s governing board, the Board of Visitors, used The Tank on several occasions to meet and make important decisions for the university while still maintaining safety practices for social distancing.

Needless to say, the new classroom has already provided a huge return on investment by offering a safe alternative to large gatherings, and by allowing JMU X-Labs to expand to meet its growth and fulfill the needs of students from all 58 majors across campus.



# The FARMERS MARKET goes ONLINE

On March 28th, the Harrisonburg Farmers Market announced its closure due to social distancing restrictions as a result of the COVID-19 pandemic. For years, the market has been central to the culture of downtown Harrisonburg and has been known for its bustling activity and rich community engagement, so the closure was a huge blow to the local community as well as the farmers and other vendors.

After Farmers Market Manager Josie Showalter talked with Associate Professor Seán McCarthy from the School of Writing, Rhetoric & Technical Communication (WRTC), who just happens to be a key instructor for JMU X-Labs classes, she saw an opportunity to leverage local resources to provide an online ordering and drive-thru pickup service that could benefit the market far beyond the pandemic. McCarthy and JMU X-Labs Lab Manager Aaron Kishbaugh took charge of logistical planning, working with city and state officials to implement best practices to safely and efficiently run the farmers market during the pandemic. Three of McCarthy's graduate WRTC students, Dylan Crigger, Lacie Knight, and Laura Siegel, created an awareness campaign on social media, worked directly with vendors to get hundreds of their products online, and volunteered at the market every Saturday. In just two short weeks, the market went online and was a huge success, with 311 customers at the April 11th opening and a whopping 455 customers the following Saturday.



The team continues to incorporate feedback from the vendors and the community to improve the system, and they are working with Project Grows, an educational, nonprofit organization, to help markets in Staunton, Waynesboro, and North Augusta County go online as well. Because the collaboration resulted in a stronger, more resilient market, the Farmers Market and JMU X-Labs want to keep up that momentum and are also working with local web designers and the Gilliam Center for Entrepreneurship to design a custom-built e-commerce site for the market.

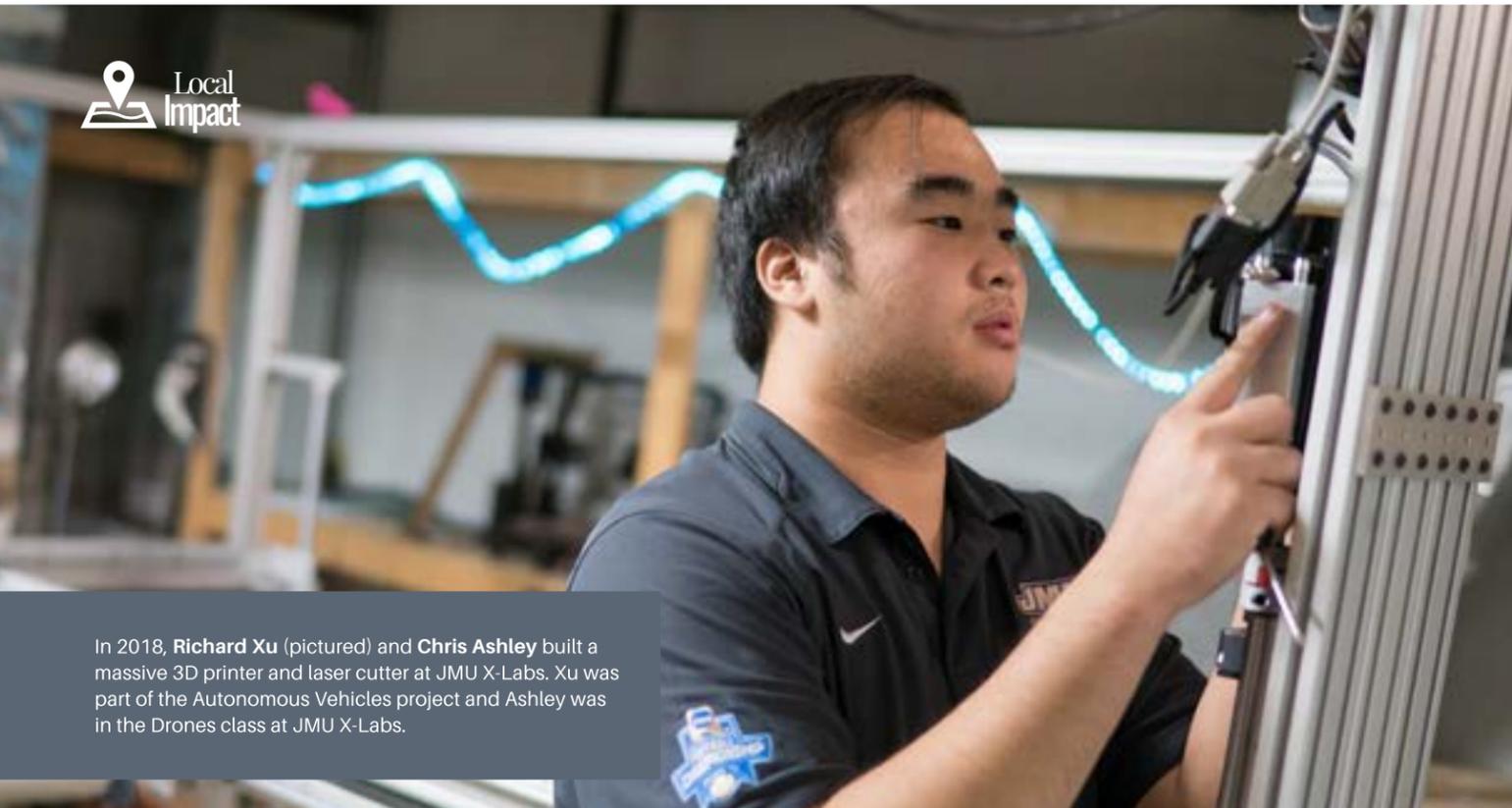


**Right & Inset** | Masked vendors and volunteers collected and packed up items for each order and delivered them to customers, who stayed in their cars at the Turner Pavilion, thus limiting contact between people and goods.

What happens when you develop a culture of innovation and a bias towards action? A lot of little things that contribute towards a movement—a change in mindset—a change in what's possible. There's a reason why "Being the Change" is the motto at JMU, and it could not be more relevant than during the challenges posed by COVID-19. At JMU X-Labs we challenge students and faculty from across campus to dive into some of the most challenging problems—where there is no "major," and this is just one example of how that plays out in real life.

# Pivoting *around* a PANDEMIC



In 2018, **Richard Xu** (pictured) and **Chris Ashley** built a massive 3D printer and laser cutter at JMU X-Labs. Xu was part of the Autonomous Vehicles project and Ashley was in the Drones class at JMU X-Labs.

Richard Xu graduated from JMU in 2018 with a bachelor's degree in engineering, started a company called Vulcan Machine Co. with fellow JMU alumnus Chris Ashley, and built a mill that makes 'making' affordable for micro-fabricators, inventors, hobbyists, and educators.

Little did they know that a mere two years later, their company would be pivoting to support health workers during a worldwide pandemic. With an established supply chain in Europe and Asia, they retooled their equipment to produce essential personal protective equipment (PPE),

including face masks and nitrile gloves, distributing them at low cost in high demand areas.

Both Xu and Ashley had participated in JMU X-Labs classes and programs and readily applied the concepts they had learned to pivot around these novel circumstances.

"When you go to [JMU] X-Labs, the focus switches from thinking about the best solution to implementing a solution that will work right now," Xu said. "In my mind, if I can get a solution by the end of the week, it's a lot better than thinking about creating the perfect solution."

  
**100,000+**  
 PPE Distributed

As of mid-April, Vulcan Machine Co. has already distributed over 100,000 face masks and other PPE to medical facilities and are now heading a charitable effort to donate PPE to National Guard units.



Photo by 1st Special Forces Group Public Affairs Office



Photo by Jacob Wrightsman

When the COVID-19 pandemic hit, Vulcan Machine Co. quickly pivoted from milling to distributing PPE, such as the masks shown in these photos, using their pre-existing supply chains in Asia and Europe.



Photo by Matthew Keeler

# POSTPONING Presentations



In March of 2019, one of the co-founders of the annual ASU GSV Summit, Deborah Quazzo, saw the JMU X-Labs article on the front page of *The Chronicle of Higher Education* and was so impressed, she invited a team of JMU X-Labs faculty to be on a panel at the 2020 event. Because of its high-profile status, speakers at previous summits have included Andre Agassi, Tony Blair, Richard Branson, George Bush, Bill Gates, Magic Johnson, John Legend, Matthew McConaughey, Barack Obama, Condoleezza Rice, and many others. JMU X-Labs Executive Director Nick Swayne was set to moderate a panel of the following JMU faculty on a main stage during the summit:

- Bernie Kaussler, Political Science
- Erica Lewis, Nursing
- Patrice Ludwig, Biology
- Ben Selznick, Strategic Leadership Studies

ASU GSV XI was originally scheduled for March 30 - April 1, 2020 in San Diego, California, but just weeks before the event, the United States declared a national emergency due to the COVID-19 pandemic, and the Centers for Disease Control and Prevention advised against gatherings of 50 or more people in the U.S. Although ASU GSV had no choice but to cancel the original event, they have already rescheduled it for September 29 - October 1, 2020, and the JMU X-Labs team remains optimistic that the show will go on this fall.



Every year, South by Southwest (SXSW) brings together enthusiasts for film, interactive media, and music, all in a single

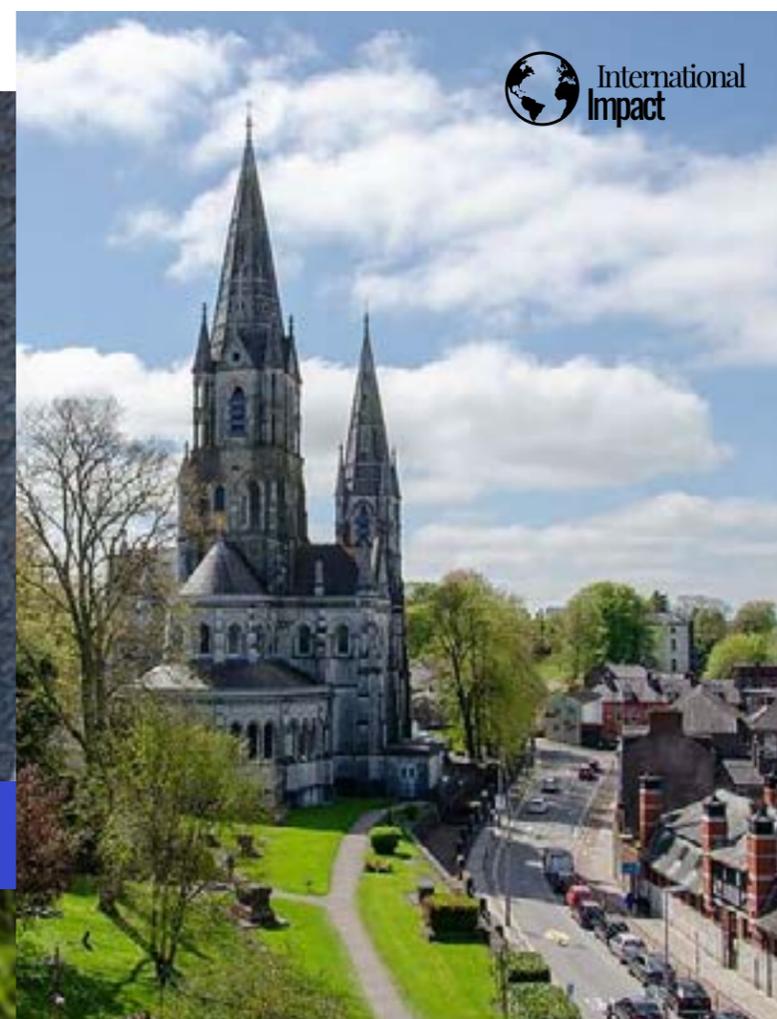
conference, boasting more than 73,000 in attendance in 2019.

In October of 2019, SXSW asked JMU X-Labs to run a workshop at the 2020 conference in Austin, Texas, which was scheduled for March 13-21. Competition for spots at this popular event runs high, so the team was honored to be invited. The workshop was slated to cover innovation in higher education by three of the team's faculty members: Executive Director Nick Swayne, Associate Professor Seán McCarthy (Writing, Rhetoric and Technical Communication) and Associate Professor Patrice Ludwig (Biology).

However, following national and global health precautions regarding the COVID-19 pandemic, the City of Austin cancelled all SXSW events on March 6th. SXSW continues to meet with relevant agencies to plan for a safe event, and once circumstances allow, the team looks forward to leading the workshop at the event.



ASU GSV hopes to hold its summit in San Diego again, despite the COVID-19 pandemic.



Both SXSW and EAIR plan to host their events either in person or online, despite the pandemic, in Austin, Texas (above) and Cork, Ireland (left), respectively.



In the spring of 2020, the European Higher Education Society (EAIR) invited JMU X-Labs to Cork, Ireland for their 42nd Annual EAIR Forum 2020 at University College Cork,

August 20-22, 2020. Just days later, they announced that they're preparing to host the conference online if the situation calls for it, but they hold out hope that the forum can take place as planned.

For the story about 41st Annual EAIR Forum 2019 at Leiden University in The Netherlands, see page 18.

# A Growing INTERN PROGRAM



Left to Right | **Alecia Munnings** (Architecture), **Emily Marsch** (Geology), **Cameryn Norris** (Studio Art), and **Robin Lagodka** (International Affairs) all joined the JMU X-Labs student intern team in September 2019.

JMU X-Labs Pop-Ups and Open Lab have grown exponentially over the past year, creating a demand for more student interns. After developing a process for hiring the right students and an intern training program that involves project organization, communication and feedback, the team knew it was time to scale up the program.

“Our first five interns proved themselves beyond measure,” said Assistant Director Kelsey Hartman, “they’re proactive and reliable, and now they’re all experienced leaders who exclusively run and teach our Pop-Ups! Since they’ve so readily met our high expectations, we felt confident that we could find more students who would be the right fit for us.”

After interviewing many students, the team hired four new interns, essentially doubling the size of the team.

“All of our interns really are extraordinary,” said Director of Programming Emily Winter, “and we were lucky enough to find four more people who step up to challenges, come up with smart solutions to problems, and aren’t afraid of leading their peers in our various design Pop-Up workshops.”

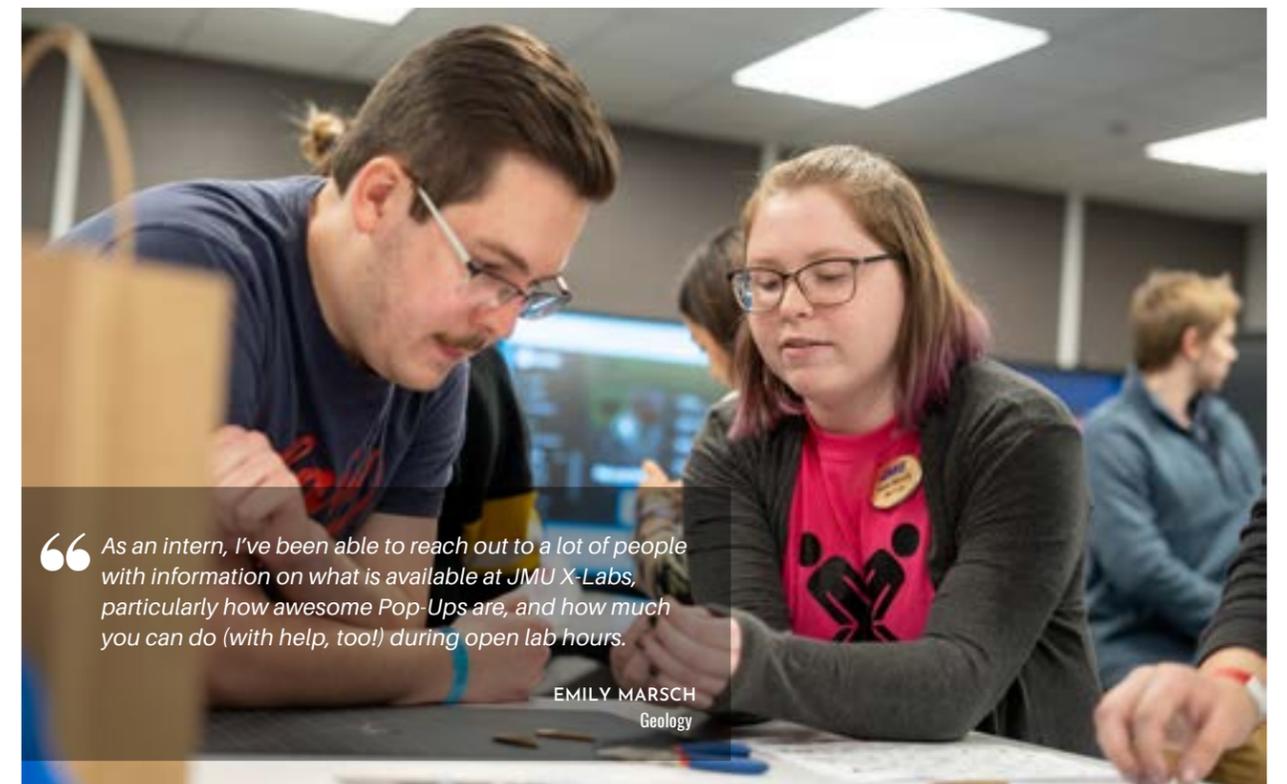


Above | Senior architecture major **Alecia Munnings** teaches students how to design and make glass-etched jars using the vinyl cutter and etching cream at Fab Lab 2020 (page 38) in January.

“Working at JMU X-Labs is infinitely more open-ended than other jobs I’ve had,” said sophomore geology major Emily Marsch, “I’ve gained so many technology and engineering skills from having to ask for help in order to complete a project assigned to me, and I think that’s pretty unique. You really don’t need any knowledge of the technology going into it, just a positive attitude and a willingness to learn.”

Within her first two months as a JMU X-Labs intern, Marsch had already taught herself LED programming in preparation for a Pop-Up and designed and developed a seven-week Digital Fabrication Class specifically tailored to teach students how to create a complex piece in Adobe Illustrator that incorporates laser cutting, vinyl cutting, or both as a means of fabrication.

“My favorite part of the job is being able to make so many cool projects for myself as we practice for Pop-Ups and make samples,” Marsch said, “Being able to use all the technology available is also fun because it makes you feel like you’re at the cutting edge, like you’re ahead of the game when it comes to what’s up-and-coming in the world.”



“As an intern, I’ve been able to reach out to a lot of people with information on what is available at JMU X-Labs, particularly how awesome Pop-Ups are, and how much you can do (with help, too!) during open lab hours.”

EMILY MARSCH  
Geology

JMU X-Labs student interns learn invaluable leadership skills and pass them on through our programming, which increases capacity and amplifies the impact of the lab.

## Student INTERN

# Jessica Maroney ('19)



“Through working at JMU X-Labs, I have gained so much confidence and found my passion for working with people to create beautiful, immersive projects. This job has led me to so many great people and expanded my skills more than I could ever have imagined. I am so grateful for JMU X-Labs!

JESSICA MARONEY  
Writing, Rhetoric & Technical Communication

*"Working at JMU X-Labs has definitely changed my life and my JMU experience."*

JESSICA MARONEY  
Writing, Rhetoric & Technical Communication

### Joined the team

Spring 2019

### Fulfilling work

I've had one other internship as a technical writer in NYC. I enjoyed that position, but it wasn't nearly as creative or fulfilling as my work at JMU X-Labs. My internship here allows me the freedom to figure out what I can do best and what I take pleasure in the most.

### Contributions

I feel that I have given boundless enthusiasm to this team and everyone I work with in Open Lab and Pop-Ups. I have a passion for helping people brainstorm ideas and bring those ideas to life, so I am always happy to sit down one-on-one with someone and create something beyond imagination.

### Favorite part of the job

My favorite part of the job is witnessing all of our hard work and preparation pay off on the day of one of our events. Whether it's a Pop-Up or a larger event, like Fab Lab, the JMU X-Labs team is so committed to figuring out details for how things will run. I especially love to design and create examples of what participants can make.

### Impact

Working at JMU X-Labs has definitely changed my life and my JMU experience. As a freshman, I was shy and unsure how I could make this school feel like home. Through working at JMU X-Labs, I have gained so much confidence and found my passion for working with people to create beautiful, immersive projects. This job has led me to so many great people and expanded my skills more than I could ever have imagined. I am so grateful for JMU X-Labs!



**Opposite** | Jessica Maroney teaches a Pop-Up she designed and planned with a local business.

**Left** | Maroney and fellow interns Cassidy Welch and Madison Carrillo do outreach on campus by taking Pop-Ups "on the road."

# All Together One

Our Award-Winning Student Interns are Helping to Build a Culture of Creativity



In 2020, the Omicron Delta Kappa Society awarded the JMU X-Labs student intern team with an All Together One award for embodying the JMU spirit in their work. Each intern offers unique contributions to the team and together they bring these attributes to work on a daily basis.

- Building community
- Caring attitude
- Commitment to working together
- Dedication to learning
- Inspiring others

Left to Right | Robin Lagodka, Emily Marsch, Cameryn Norris, Madison Carrillo, Alecia Munnings, Jessica Maroney, and Miranda Landmann led the third annual Fab Lab event in January of 2020.



## COVID-19

Since the team was in the midst of the stay-at-home order, Sally James and Shae Powell from Student Activities and Involvement visited our weekly Webex meeting and surprised the team with an announcement that they had won the All Together One award.



Prior to the pandemic, the JMU X-Labs student intern team was facilitating three Pop-Up workshops (page 46) a week with up to 30 participants at each one, 37 hours of Open Lab (page 44) a week, and at least one large-scale event per semester. With this type of programming, we were able to reach the greater part of campus as well as some of the surrounding community. Our interns also looked for new local partnerships (page 48) for Pop-Up topics to attract and engage with diverse campus populations, and they developed partnerships with student organizations such as business fraternities, financial wellness organizations, and community service organizations. Always going above and beyond, the interns also led our third annual Fab Lab

event (page 38), expanding programs for the low barrier event and reaching more than 180 students.

When the pandemic hit in March, and the interns were no longer able to host in-person events, they found innovative ways to help JMU students stay connected, such as creating a TikTok account and launching a podcast (page 72) about people's responses to the pandemic and racial injustice. Coming from a variety of different backgrounds and majors (Architecture, Biology, Communication Studies, Geology, International Affairs, Media Arts & Design, Studio Art, and Writing, Rhetoric and Technical Communication), the interns have enriched JMU X-Labs programming beyond our greatest expectations.



**Above Left** | Alecia Munnings works with Airillusions owner Mark Powell to test airbrushing a door mat in preparation for a Pop-Up. **Above Right** | Robin Lagodka helps a student create a design for the vinyl cutter. **Left** | Miranda Landmann and Cassidy Welch help prepare popcorn before adding specialized flavoring during the Pop-Up partnership with Shirley's Gourmet Popcorn. **Right** | Cameryn Norris helps students during Fab Lab—the biggest event of the year.



Our eight student interns from eight different majors strengthen the JMU X-Labs culture of creativity and bring diverse perspectives to the ecosystem of innovation.

## Student INTERN

# Cassidy Welch ('19)

“When I first started working here I had never been to a Pop-Up class, open lab hours, or used any of the technology. After working here for two semesters I feel confident in my ability to boost confidence in others who are new to JMU X-Labs.”

CASSIDY WELCH  
School of Media Arts & Design



*"Working here has given me confidence in problem solving. With all the interns coming from different majors, I have learned that there is always more than one way to look at things."*

CASSIDY WELCH  
School of Media Arts & Design

**Joined the team**  
Spring 2019

**Favorite project**

My favorite project has been working on Fab Lab. Getting to brainstorm a bunch of awesome ideas and see them come to life at an event that big was something I had never done before.

**Contributions**

Since I am the only Media Arts & Design major on the intern team I've contributed by designing promotional material for JMU X-Labs and our events. I think I've helped other students and community members feel empowered while using our technology. We strive to help others feel comfortable designing, brainstorming ideas and executing them using our equipment so getting to see that process come full circle is really neat. It's great seeing someone you've helped in a Pop-Up come in during open lab—and bring friends!

**Favorite part of the job**

My favorite part of the job is working with the other interns and staff. I love brainstorming new ideas for Pop-Ups or Fab Lab with the other interns. We have a close team full of supportive and encouraging individuals that make going to work a joy.

**Impact**

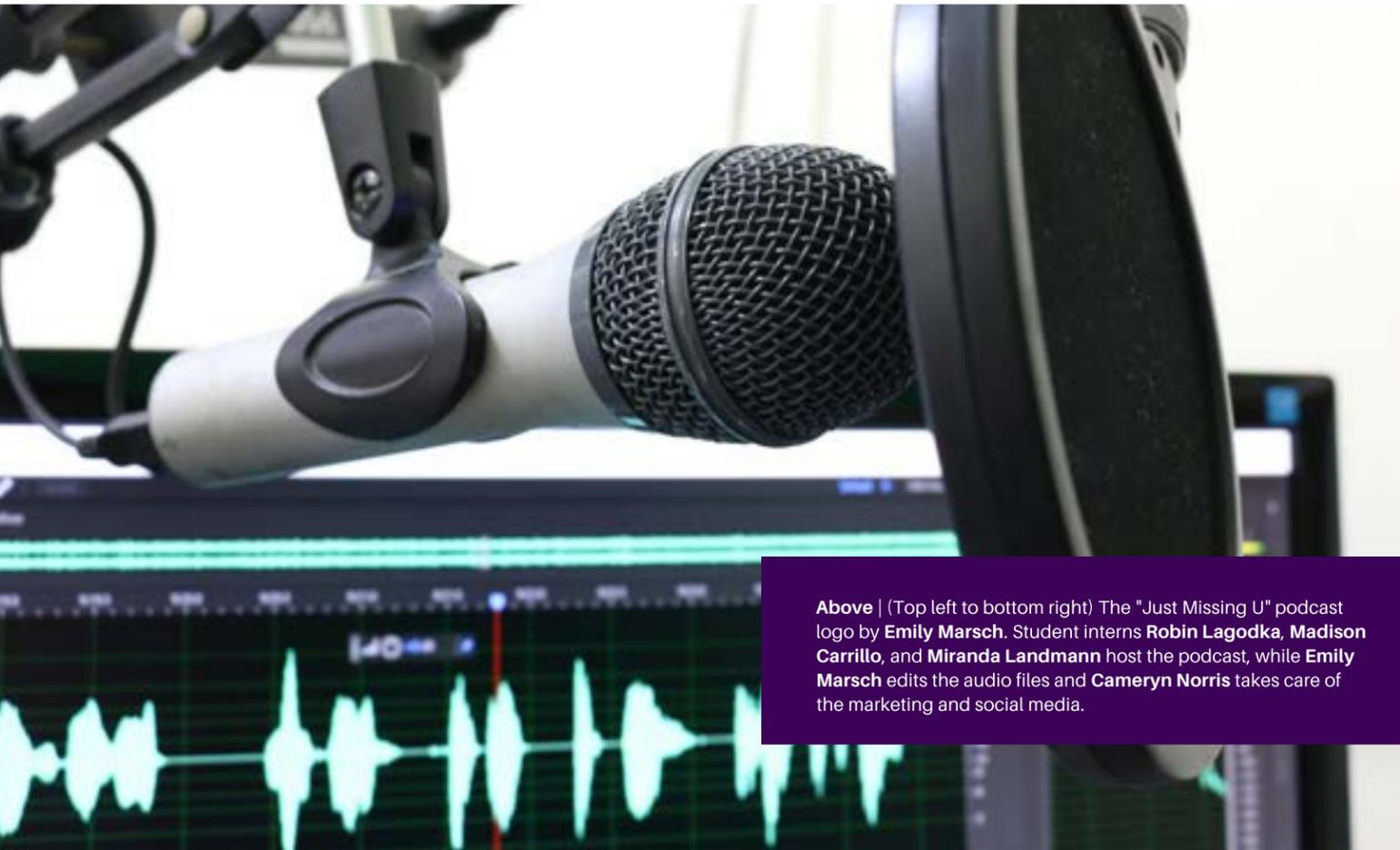
Working here has given me confidence in problem solving. With all the interns coming from different majors, I have learned that there is always more than one way to look at things. When I first started working here I had never been to a Pop-Up class, open lab hours or used any of the technology. After working here for two semesters I feel confident in my ability to boost confidence in others who are new to JMU X-Labs.



**Opposite** | Cassidy Welch makes design thinking accessible to students at Fab Lab 2019.  
**Below** | Welch and fellow interns **Miranda Landmann** and **Jessica Maroney** do outreach on campus with the Pumpkin Palooza Pop-Up.



# Podcasting about the PANDEMIC



Above | (Top left to bottom right) The "Just Missing U" podcast logo by **Emily Marsch**. Student interns **Robin Lagodka**, **Madison Carrillo**, and **Miranda Landmann** host the podcast, while **Emily Marsch** edits the audio files and **Cameryn Norris** takes care of the marketing and social media.

When JMU sent out the email that students would not be returning to campus after spring break, a wave of shock and grief swept through the JMU community. As the reality of the pandemic gradually sank in over time, it weighed on everyone's hearts to know that things would likely never be the same.

As we adjusted to this "new normal" of working from home and connecting primarily through devices, all we

knew was what we read in the news or heard through our contacts. Everyone at JMU from the students to the faculty and administrators rose to the challenge and found a way to quickly get online. The one thing we didn't really know was—what was it like on an individual basis for people across JMU in response to COVID-19?

At the same time, JMU X-Labs Founding Director Nick Swayne had been wondering how we could give both

## Just Missing U *Our first series!*

Taiwan, Hacking for Diplomacy class



KEVIN PENG  
Economics Major

Countering loneliness in a quarantine



NATALIE KERR  
Professor of Psychology

How JMU is facing the pandemic



BOB KOLVOORD  
Dean of the College of Integrated Science and Engineering

COVID-19 Summer Course Series - Writing



MICHAEL KLEIN  
Associate Professor of Writing, Rhetoric and Technical Communication

COVID-19 Summer Course Series - Biochemistry



CHRISTOPHER BERNDSEN  
Associate Professor of Biochemistry and Enzymology

COVID-19 Summer Course Series - History



REBECCA BRANNON  
Associate Professor of History

Advice for current and incoming students



TIM MILLER  
Vice President for Student Affairs

Financial support for students



BRAD BARNETT  
Director of Financial Aid & Scholarships

Parents as grad students Parenting in a pandemic



KERRY CRAWFORD  
Associate Professor of Political Science

COVID-19 Summer Course Series - Philosophy



PIA ANTOLIC-PIPER  
Assistant Professor of Philosophy

Teaching online, Spanish dialects, and travel



JOHN TKAC  
Lecturer of Spanish

Teaching online, Transition of dialogue class



JENNIFER PEEKSMEASE  
Assistant Professor of Communication Studies

JMU communications, 2020 commencement



ANDY PERRINE  
Associate Vice President of Communications and Marketing

Transitioning Harrisonburg Farmer's Market online



SEÁN MCCARTHY  
Associate Professor of Writing, Rhetoric and Technical Communication

Restaurants, employees, and owning a business



AARON LUDWIG  
Founder of Billy Jack's Shack and Jack Brown's Beer & Burger Joint

prospective and long-time students and faculty insight into "the JMU way" during a time when people were unable to see it for themselves on campus. With that in mind, he asked the JMU X-Labs team to consider hosting a podcast. Assistant Director Kelsey Hartman and Director of Programming Emily Winter came up with a plan and asked the student interns if they were interested. Not only were the interns interested, they took the plan and ran with it,

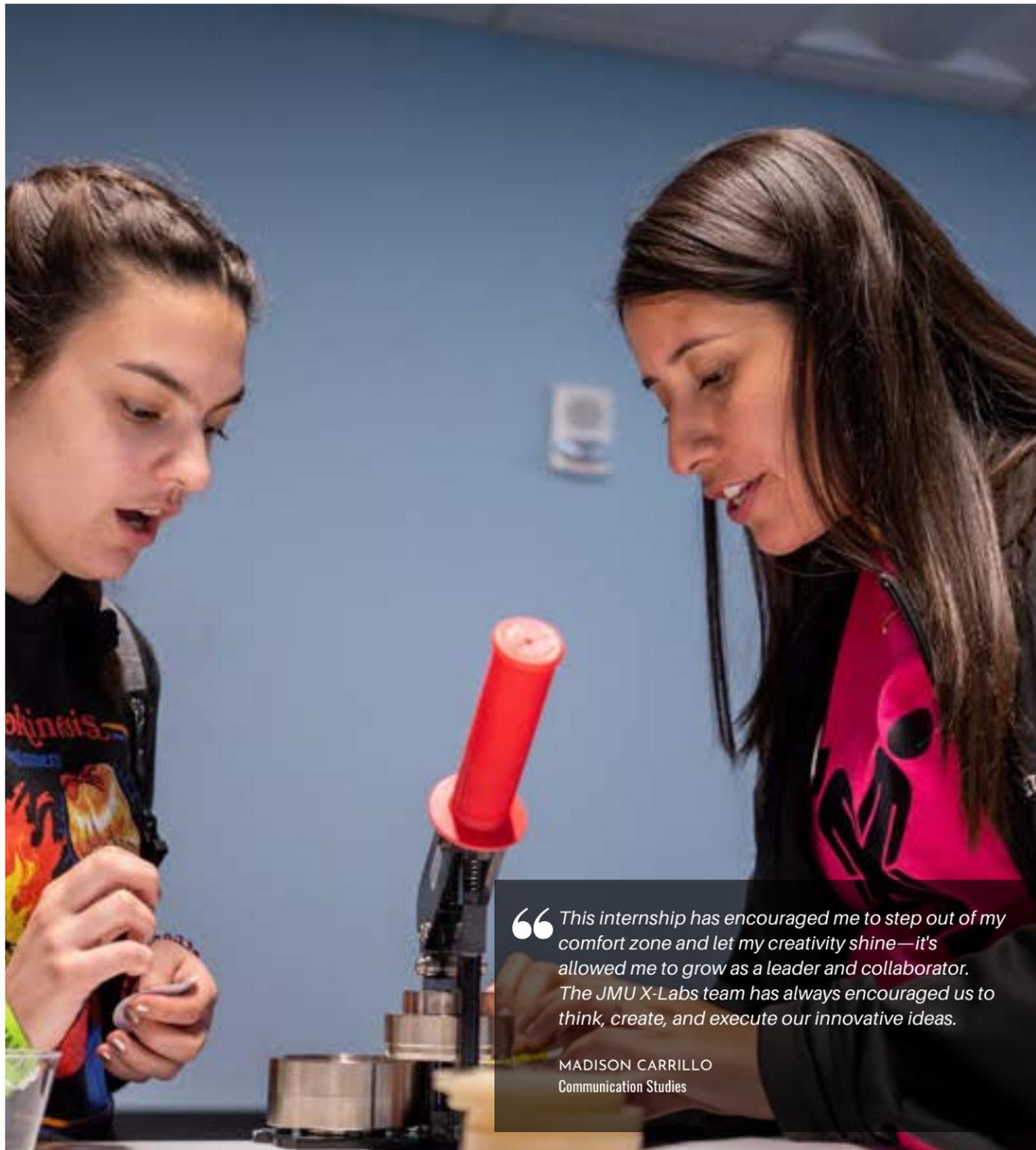
and are now releasing three new episodes every week. With interviews from students, faculty, staff and administrators, the podcast offers everything from comic relief to helpful tips to combat loneliness and insights into how JMU is taking care of its people and carrying out its mission despite the pandemic.

To subscribe to the podcast, search for "JMU X-Labs" on Spotify or Apple Podcasts.

Influencing up to 90 students a week through our programming, the student interns make it possible to reach far more people than our staff could alone.

## Student INTERN

# Madison Carrillo ('20)



*“This internship has encouraged me to step out of my comfort zone and let my creativity shine—it’s allowed me to grow as a leader and collaborator. The JMU X-Labs team has always encouraged us to think, create, and execute our innovative ideas.”*

MADISON CARRILLO  
Communication Studies

*“This job has allowed me to expand my skill set in a way I never thought possible and to help others who may have never had this experience otherwise.”*

MADISON CARRILLO  
Communication Studies

### Joined the team Fall 2018

### Favorite project

My favorite project has been laser-cut luggage tags. I used to be terrified of the laser cutter, but this project helped me get comfortable with the technology. I loved seeing everyone’s creativity come out when designing their tags and the final products were incredible!

### Contributions

Something that sticks out to me is how much I have been able to empower students to feel comfortable to utilize and create in our space. Walking into the lab for the first time can be very intimidating, but I have always tried my best to make everyone feel capable and welcome.

### Favorite part of the job

The JMU X-Labs team is so encouraging and always ready to listen to our crazy ideas. My other favorite part of the job is helping people in Open Lab hours. It’s always fun to see people’s excited faces when I tell them about the many free resources. It’s cool to watch someone go through a creative process and help them along the way.

### Impact

Working at JMU X-Labs has allowed me to grow in a field I would have never imagined myself in. If you had told me freshman year that I would be leaving JMU with the capability to operate a laser cutter or vinyl cutter, I would have said “What the heck is that?” This job has allowed me to expand my skill set in a way I never thought possible, and has allowed me to help others who also may have never had this experience otherwise.

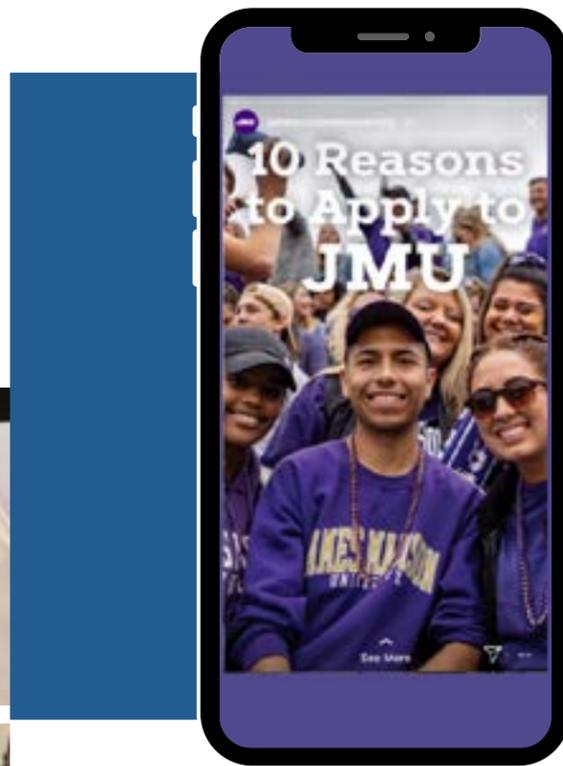
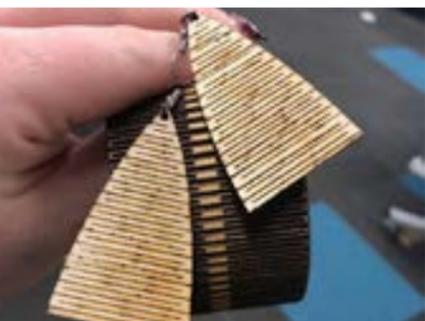


**Opposite | Madison Carrillo** teaches a student how to design and make a magnet at Fab Lab 2020 (page 38).

**Right | Carrillo** and fellow intern **Miranda Landmann** lead a trivia game at JMU X-Labs during the JMU Family Weekend event.

# Social MEDIA

Social media helps build an ecosystem of innovation in action and reaches students where they are—and it works!



October 13, 2019

▶▶▶

A James Madison University Instagram story listed "JMU X-Labs' Innovative Opportunities" as one of 10 Reasons to Apply to JMU.



## @ Top Instagram Posts

Below Top Left | Personalized apparel Pop-Up Bottom Left | DIY T-Shirt Pop-Up with @howtodyehappy Bottom Center | Missing everyone at JMU during the pandemic Bottom Right | Fab Lab 2020 scratch-off wings



Above | JMU X-Labs programs intentionally use social media to engage with students throughout the year, as well as during events like Fab Lab, Pop-Ups, and Open Lab. Students are encouraged to like @jmuxlabs and send photos of their creations to JMU X-Labs social platforms to complete activities at these events and win prizes.

@jmuxlabs by the numbers

1,782

Instagram Followers



1,240

Pinterest Impressions



1,050

Facebook Followers



293

Twitter Followers



# Thank You!

# INDUSTRY SUPPORT

JMU X-Labs would like to offer a special thank you to our supporters:

- Thank you to JMU President Jonathan Alger, Provost Heather Coltman, and the entire senior leadership team for supporting our campus community and our students.
- Thank you to Charlie King for his continued support of our growing program and spaces.
- Thank you to Dr. Bob Kolvoord for his advocacy for innovation and his passion for transdisciplinary student experiences on our campus.
- Thank you to Dale Hulvey for his support, expertise, and guidance since the inception of 4-VA and JMU X-Labs.
- Thank you to the 4-VA working group, comprised of Campus Coordinators and Deputy Campus Coordinators who work to collaborate amongst our eight Virginia institutions
- Thank you to the JMU deans and department heads for their incredible support of 4-VA and JMU X-Labs faculty research, scholarship, and teaching.
- Thank you to all of the fiscal technicians, administrative assistants, and campus partners who make transdisciplinary work across campus possible.
- Thank you to Diana Sharpe for her amazing attention to detail, prompt responses, and all she does to help us every day.
- Thank you to our partners at Dell, Bluescape, and Epson for their partnership in bringing cutting edge technology to higher education.
- Thank you to David Lamm for answering our many questions, providing the best network support, and for keeping all of our systems upgraded.
- Thank you to our 4-VA Steering Committee for their valuable input, time, and commitment to faculty and undergraduate research on campus.
- Thank you to Andy Perrine, Khalil Garriott, Eric Gorton, Mike Miriello, Elise Trissel, Justin Roth, Nanfei Liu and the entire team at University Communications & Marketing for their invaluable partnership in helping us promote JMU students and faculty.
- Thank you to Peter Blake, Wendy Kang, and the State Council of Higher Education for Virginia for their continued support of the 4-VA collaborative.
- Thank you to Jim West, Eric Hansen, Bill Hartman, Drew Davis, and the LET Support and IT Helpdesk teams for all of their assistance with classroom technology and campus videoconferencing.
- Thank you to our phenomenal team of student interns for the 2019-2020 year: Madison Carrillo, Jessica Maroney, Cassidy Welch, Miranda Landmann, Alecia Munnings, Cameryn Norris, Emily Marsch, Robin Lagodka, and Linda McGowan. They inspire us daily and we can't wait to see the positive impact they continue to make on the world.
- Thank you to Kaitlin Ilnitzki for being such a wonderful partner and for sharing her vision for bringing innovation to students of all ages through her leadership with FIRST LEGO League Virginia + Washington, D.C.



As a result of the February 2019 JMU X-Labs article on the front page of *The Chronicle of Higher Education*, the Charles Koch Foundation provided \$45,000 of funding for JMU X-Labs to develop a faculty curriculum.



In August 2019, a JMU X-Labs student team from the Internet of Things class was awarded a \$20,000 Technology for Conservation (T4C) University Grant from Northrop Grumman and Conservation International towards developing an innovative technology that will help them understand animal behavior to make informed conservation decisions.

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# Previous PUBLICATIONS | Previous publications can be found at [jmuxlabs.org/reports/](http://jmuxlabs.org/reports/)

