

A NATO Solution

Students present to NATO in Croatia

Page 58



2018-2019

JMU



Labs

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 4-VA



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EDITOR IN CHIEF | CREATIVE DIRECTOR | DESIGNER

Kim Fisher

PRODUCTION MANAGER

Kelsey Hartman

GRAPHIC DESIGN

Emily Winter

CONTRIBUTING PHOTOGRAPHERS

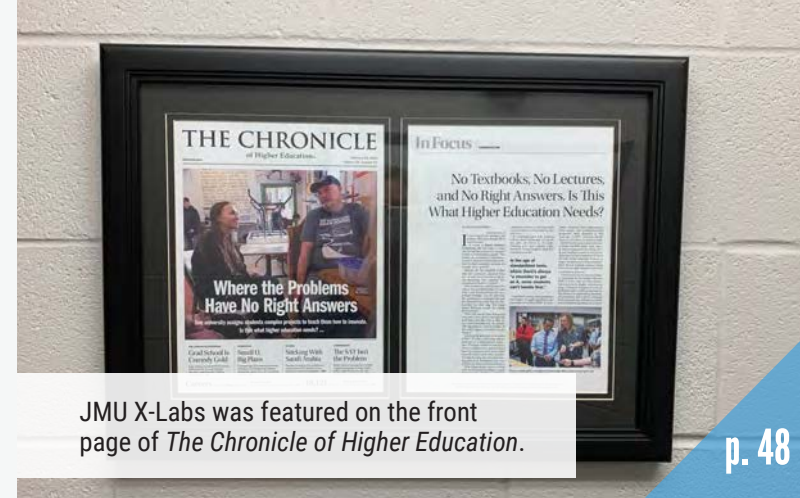
Elise Trissel, Mike Miriello, Kim Fisher

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@jmuxlabs



JMU X-Labs was featured on the front page of *The Chronicle of Higher Education*.

p. 48



JMU X-Labs offers transdisciplinary, project-based academic courses.

p. 4

2018-2019 was a big academic year for JMU X-Labs, culminating in direct support from AT&T (p. 50) and a featured article on the front page of the prestigious *The Chronicle of Higher Education* (p. 48).

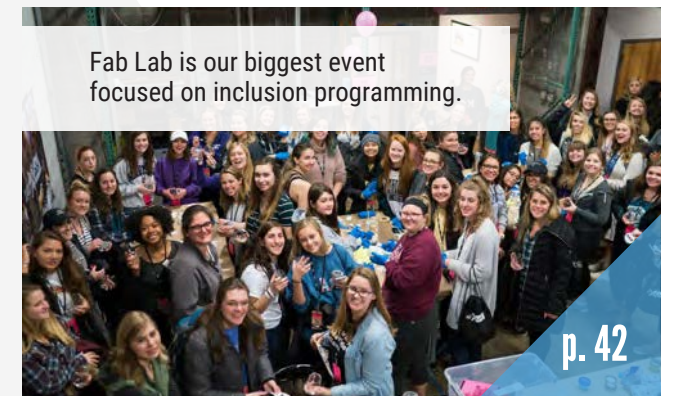
JMU X-Labs started in 2015 with the intention of sharing STEM courses as part of the 4-VA course sharing initiative, which seeks to leverage resources and provide access to courses that prepare students for jobs that don't yet exist in the market.

Since the debut of its pilot courses in medical innovations and drones applications, JMU X-Labs has evolved into a model of education that offers transdisciplinary, project-based academic courses (p. 4) where students learn design thinking and work directly with client partners in government, industry and nonprofit organizations to solve real problems.

After tackling such problems for organizations like United Way, the Smithsonian and the Department of Homeland Security, the program has even

garnered attention from institutions like Stanford University (p. 56) and the Universidad Tecnológica de Bolívar in Cartagena, Colombia (p. 26).

In scaling up the program to meet these increasing demands, JMU X-Labs has come into its own by developing unique inclusion programming. Specially designed events—such as Pop-Ups (p. 38) and Open Lab (p. 34)—provide low-barrier exposure and accessibility to design thinking and emerging technologies, elevating the students' ability to solve problems creatively and generating a pipeline for JMU X-Labs academic courses.



Fab Lab is our biggest event focused on inclusion programming.

p. 42

4-VA is a collaborative partnership between six Virginia universities, based on four initiatives (p. 2). The program has a rich history dating back to 2010, when the presidents of George Mason University, James Madison University, the University of Virginia and Virginia Tech combined forces with Governor Bob McDonnell, other members of Virginia's government, the State Council of Higher Education for Virginia, and Cisco Systems, Inc. to leverage strengths across the commonwealth.

A Growing Program

This timeline is just a glimpse of how JMU X-Labs continues to meet its original mission in new ways.

2010



4-VA was founded with four initiatives:

1. Course Sharing
2. Course Redesign
3. Collaborative Research
4. Degree Completion

4-VA began with these initiatives in mind. With JMU's mission of engagement, involved faculty, and passionate students, these initiatives served as a springboard to grow the program far greater than we could have imagined in 2010.

2015



JMU X-Labs was created to share STEM courses

Since its original medical innovations and drones courses, JMU X-Labs has surged into a transdisciplinary, project-based model of education where faculty teams from across campus use design thinking to challenge and engage students across all majors, generating skills that contribute to the world in meaningful ways and lead to rewarding careers.



Interdisciplinary pilot drones course p. 14



Featured Research p. 18
The collaborative research program reaches 100+ faculty.

2019



Transdisciplinary, project-based programs continue to grow and expand.



Events p. 32
Pop-Ups offer low barrier access to innovation.



Classes p. 4
Classes develop around emerging technologies.



Featured Outcomes AT&T p. 46

Partnerships with industry strengthen community engagement.

2018-2019 Classes

A key component of our program has always been to offer and share innovative courses—originally through language and lecture courses shared via videoconferencing—and eventually through sharing pilot courses on emerging technologies like drones and virtual reality. Since 2010, we have expanded our model from just sharing with other Virginia institutions, to sharing across disciplines and with industry and the greater community.

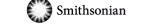
JMU X-Labs now shares 13 classes across 38 majors at JMU with over 20 client partners.

 13
Classes

 5
Pilot Classes

1. Augmented/Virtual Reality
2. Autonomous Vehicles
3. Blockchain
4. Community Innovations 
5. Creativity & Innovation 
6. Drones
7. Furious Flower 
8. Fueled
9. Hacking for Defense
10. Hacking for Diplomacy
11. Internet of Things 
12. Medical Innovations
13. Robotic Process Automation 





Sociology
Biotechnology
Political Science *Geographic*
Justice Studies *Science*
DANCE
Accounting *Statistics*
BIOLOGY **Psychology**
Communication
Studies **Physics**
INDUSTRIAL DESIGN
Engineering
FINANCE **MUSIC**
Health Sciences
International Business
Interdisciplinary
Liberal Studies
KINESIOLOGY
Computer Information Systems **Media Arts & Design**
Public Policy and Administration
ENGLISH
Economics
Integrated Science and Technology
Graphic Design
Intelligence Analysis
Marketing
MANAGEMENT
Modern Foreign Languages
Writing, Rhetoric and Technical Communication
THEATRE
International Affairs
Hospitality
Nursing
38 Majors



“By bringing together students and faculty members from different perspectives, students are able to consider road bumps that organizations working in silos run into much later in their process. For example, we may think we’ve found a housing solution that sounds great to community organizations without considering challenges that a realtor or local government official may raise. Students get ahead of that by factoring in a wide variety of perspectives from the beginning of their process.”

Laura Toni-Holsinger
Executive Director of United Way of Harrisonburg and Rockingham County



10
Majors

James Barnes
Carol Dudding
Kevin Phaup
JMU X-Labs
Communication Sciences and Disorders
Industrial Design

Augmented/Virtual Reality



This class was awarded the Governor's Technology Award for innovative use of technology in education.

Gabriel Niculescu Physics

Autonomous Vehicles

AR/VR
Featured
Outcomes

p. 52



This class developed a carpooling app for JMU students.



p. 53



p. 54



Morgan Benton Integrated Science and Technology

Blockchain

Students developed a game to educate underclassmen about transportation and food options on campus.

Creativity and Innovation

Aaron Kishbaugh JMU X-Labs

Students and faculty share their experiences and the impact the class had on their education and careers.

Lauren Alleyne introduces the website during the public unveiling.

Lauren Alleyne Cross Disciplinary Studies and Diversity Engagement
Joanne Gabbin Cross Disciplinary Studies and Diversity Engagement
Mollie Godfrey English
Seán McCarthy Writing, Rhetoric and Technical Communication

Furious Flower

This class developed solutions for composting and waste disposal on campus.

Fueled

Michael Broderick Communication Studies
Wayne Teel Integrated Science and Technology

Featured Outcome p. 70

2,967
Lines of code

529
Video clips

66
Poems



Students from 4 different disciplines researched, designed and launched a digital archive website for the Furious Flower Poetry Center while developing an understanding and appreciation for African American poetry, history, and art. The interactive exhibit developed by the class will debut at the National Museum of African American History and Culture in September 2019.

furiousflower.org





Community Innovations



After presenting their solutions, students answer questions at the United Way Board of Visitors meeting.



Students present their solutions at the JMU X-Labs Innovation Summit.



Students pose for a group shot after presenting to the United Way Board of Visitors.

Keston Fulcher
Bill Grant
Aaron Kishbaugh
Erica Lewis
Seán McCarthy
Joi Merrit
Jennifer Taylor
David Yang

Graduate Psychology
Economics
JMU X-Labs
Nursing
Writing, Rhetoric and Technical Communication
Early Elementary and Reading Education
Political Science
Center for Assessment & Research Studies



This class was featured on the front page of *The Chronicle of Higher Education*.

p. 48



“Never have I felt so accomplished in a college course!”
Madi Schultz
Media Arts & Design



Fall 2018

Students sought solutions for the following partners:

1. Gift & Thrift
2. Plains Elementary School
3. The Suitcase Clinic

Spring 2019

In partnership with United Way of Harrisonburg and Rockingham County, student teams developed solutions for the following:

1. Access to affordable childcare
2. Public transportation system challenges
3. University and local non-profit relationship challenges

This team developed a drone prototype to determine which flowers best support bee populations.

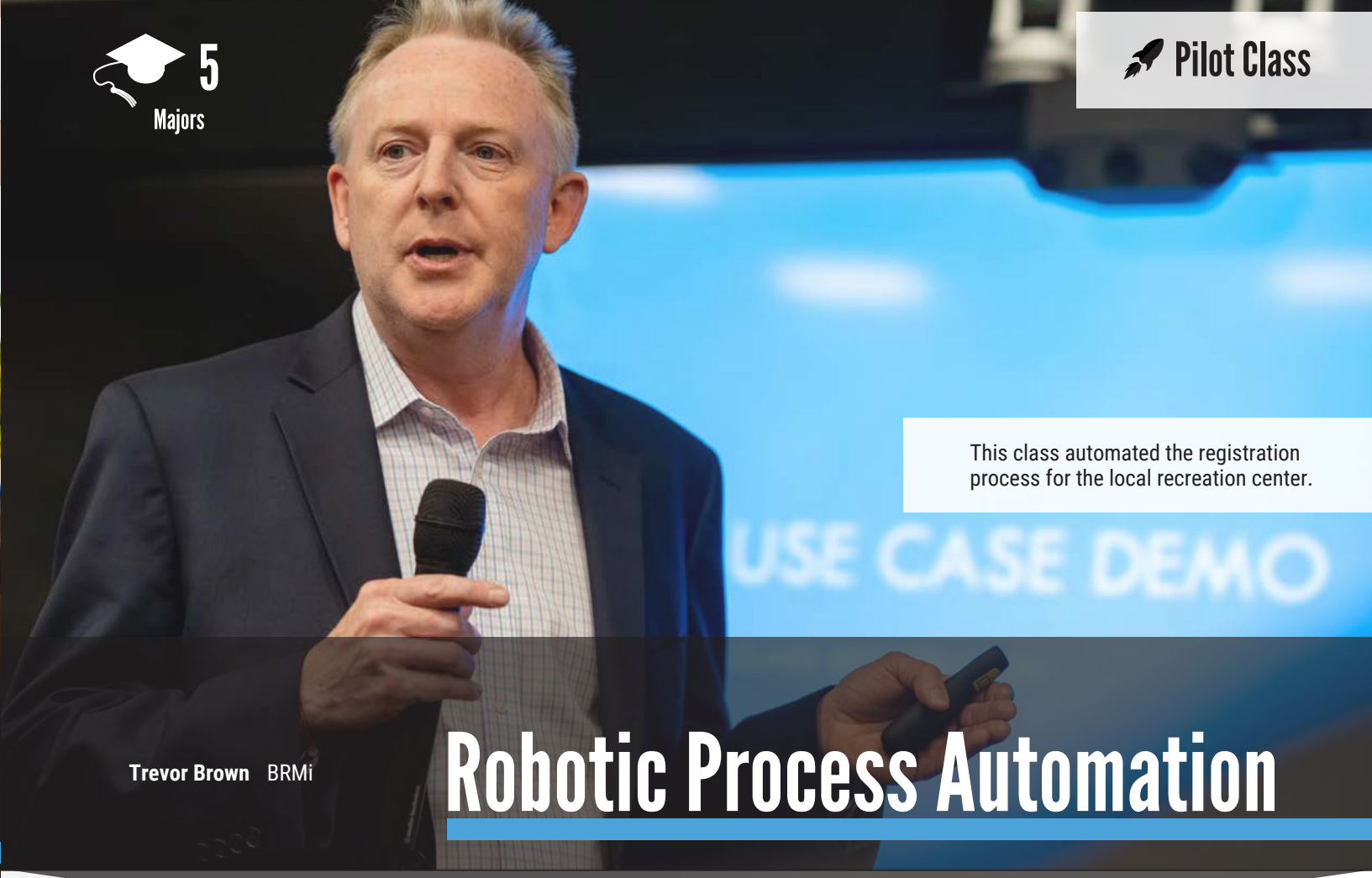
5 Majors



6 Majors

Angelo Arcchi Retired Optical Engineer
 Fred Briggs Teq Strategy
 Jade Garrett Nation of Makers
 Kevin Giovanetti Physics
 Patrice Ludwig Biology
 M. Rockwell Parker Biology

Drones



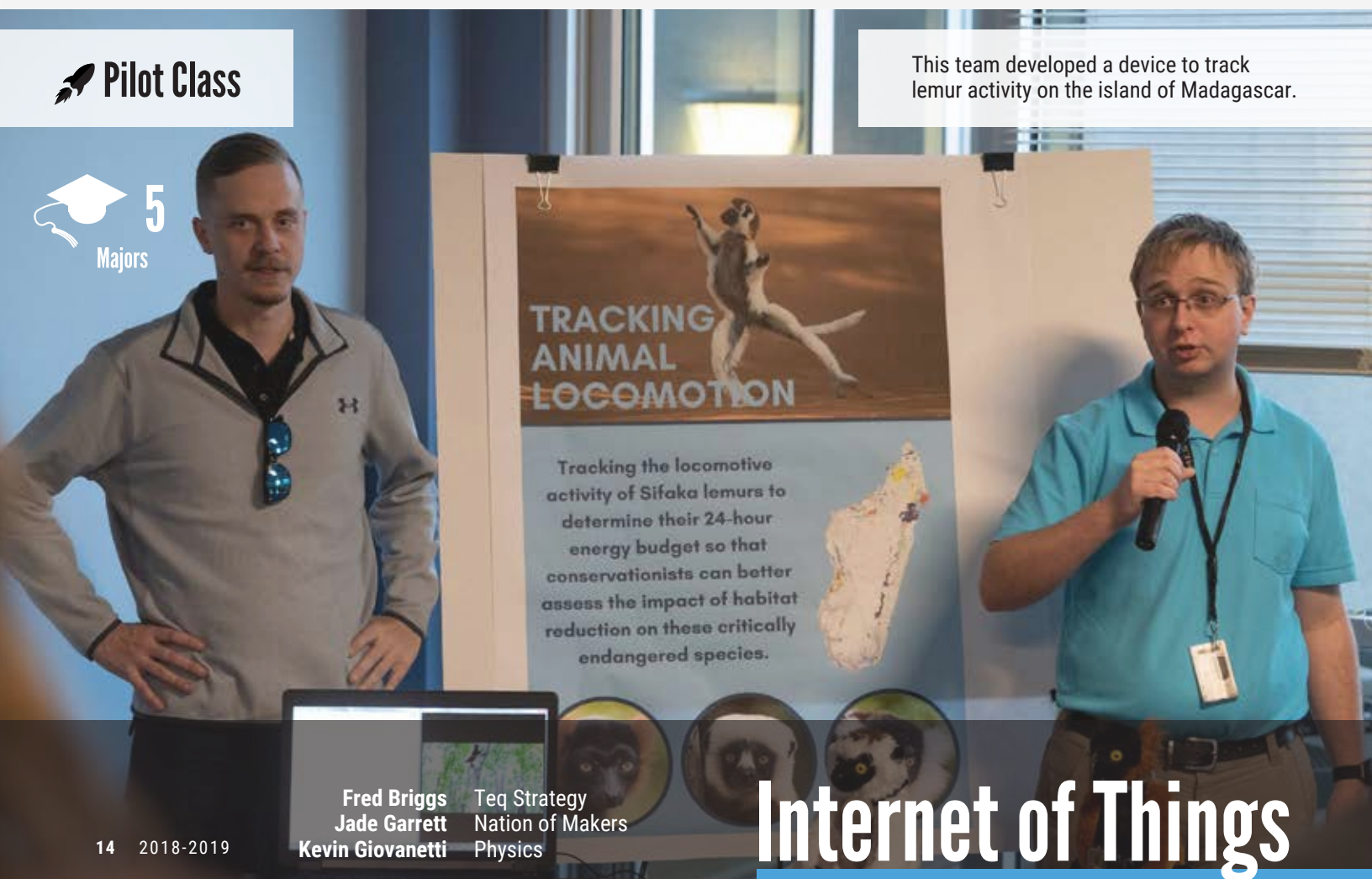
This class automated the registration process for the local recreation center.

Trevor Brown BRMi

Robotic Process Automation

This team developed a device to track lemur activity on the island of Madagascar.

5 Majors



Fred Briggs Teq Strategy
 Jade Garrett Nation of Makers
 Kevin Giovanetti Physics

Internet of Things

In the spring of 2019, JMU X-Labs partnered with BRMi to create a student learning path for RPA, a technology that optimizes work. After the semester ended, we asked BRMi about the experience.

JMU X-Labs: What was the issue you were trying to solve by coordinating with JMU X-Labs to teach RPA to students?

BRMi: The growth of Intelligent Automation industry is meteoric. There is a growing demand for talent knowledgeable in working with robotic process automation technologies and implementation strategies. We were looking for a platform to help jump-start the education of college level individuals in the RPA and broader Intelligent Automation field. We learned of the JMU X-Labs culture of innovative education, and [they] had a very "can do" attitude about pulling it off.



JMU X-Labs: What results did you see from the pilot course?

BRMi: The cadre of students immediately "got it". They communicated a resonance with the impact what they were learning could have on their early job prospects and their careers.

JMU X-Labs: Is there anything else you'd like to share?

BRMi: Our goal is to drive innovation not only in the daily lives of the students but in a broader sense for families, alums and internal operations of the university, automation solutions that will enhance the user experience of all user groups. We believe JMU X-Labs is truly an enabler of our goal.



Terry Beitzel Justice Studies
David Bernstein Computer Science
Mike Davis President's office
Bernie Kaussler Political Science
Qingjiu "Tom" Tao Intelligence Analysis

Hacking for Diplomacy (H4Di)



Steven Harper Engineering
Keith Grant Political Science
Daniel Michael Valley Engineering



Hacking for Defense

H4Di Featured Outcomes

p. 55



Students developed prototypes to help mitigate the opioid crisis.

p. 68



p. 58



The Opioid Crisis in America



Stephanie Kurti Kinesiology
Erica Lewis Nursing
Patrice Ludwig Biology

Medical Innovations

2018-2019

Featured Research

In 2012, 4-VA began awarding grants to JMU faculty and staff to fulfill its collaborative research initiative. This academic year, these grants funded 24 projects on topics ranging from cybermanufacturing to Medicaid fraud, 7 of which went to first-time grant award recipients.

 **24**
Proposals funded

 **7**
First-time grant award recipients

First-time grant award recipients

1. **Nick Luden**, Kinesiology
2. **Callie Miller**, Engineering
3. **Dana Moseley**, Biology
4. **Gretchen Peters**, Chemistry and Biochemistry
5. **Zareen Rahman**, Middle, Secondary, and Mathematics Education
6. **Ahmad Salman**, Integrated Science and Technology
7. **Marquis Walker**, Biology

With the success of JMU X-Labs, faculty began targeted research on best practices, which has culminated in a total of 11 publications, 16 conferences and \$110,000 in external funding.

 **11**
Publications

 **16**
Conferences

\$110,000
External funding



Cumulative since 2012



8/8

All colleges represented



36

Departments

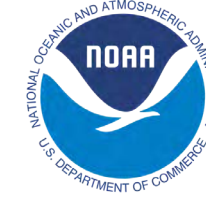


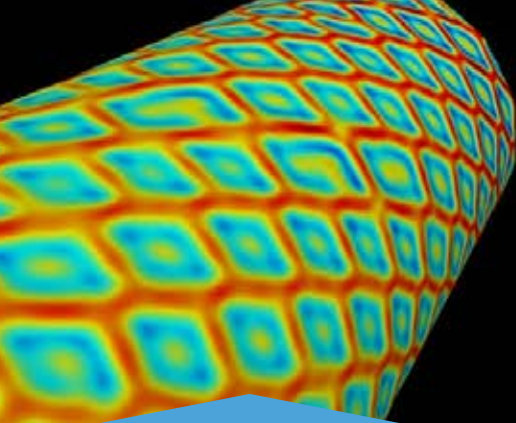
111

Total grant recipients



7 Grant Partners in 2018-2019





Deriving context from geophysical data

Reflecting on their planning and implementation process allowed pre-service mathematics teachers to experience the nuances of designing and employing high cognitive demand tasks.

Dr. Zareen Rahman
Mathematics Education



Stereo hearing tests

Our system has been validated to help Service Members and Veterans with brain injuries be less distracted by unpredictable background sounds.

Dr. Lincoln Gray
Communication Sciences and Disorders



Mammalian pupil light reflex

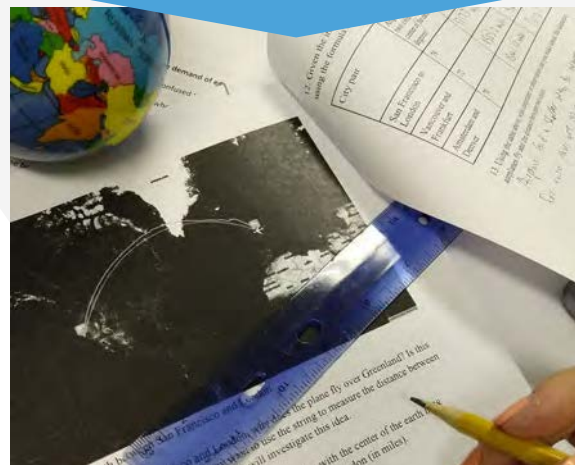
We are the first researchers to demonstrate the requirement of a signaling cation channel, Trpm1, in the pupil light reflex activity of the iris.

Dr. Marquis Walker
Biology

Smart surfaces for tuneable fluid-structure interactions

We are developing novel methods to analyze buckling, namely the mapping of the principal curvatures in a large surface, something that has not been attempted before.

Dr. Klebert Feitosa
Physics



Dynamic decision-making in cybermanufacturing systems

Our work develops intelligent manufacturing machine controls that can make smart decisions like humans.

Dr. Hao Zhang
Integrated Science and Technology



Preparing students and teachers for innovation

We developed a series of workshops which have been successfully used to instruct 5th grade students.

Dr. Kevin Giovanetti
Physics

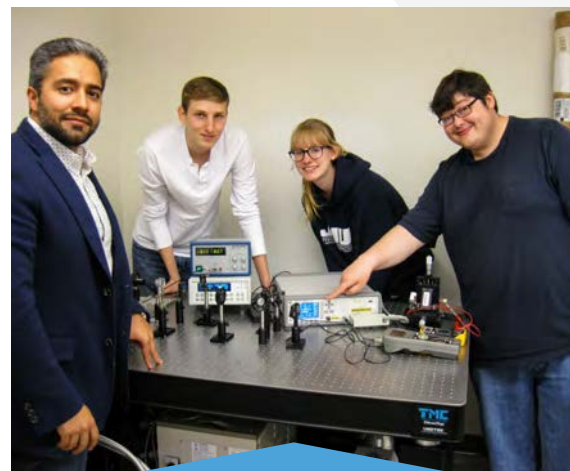


Research at a glance

Unravelling the Mysteries of Dilute Magnetic Semiconductors

What seemed like a casual coffee break during a workshop at JMU turned into a wonderful collaboration with Dr. Castano's group from VCU trying to understand how to make magnetic semiconductors.

Dr. Costel Constantin
Physics



Medicaid fraud and abuse

This project will increase access to care for patients whose only source of healthcare coverage is Medicaid, while saving taxpayers money and making sure the money is used for the right purpose.

Dr. Elham Torabi
Computer Information Systems and Business Analytics



Immersive virtual reality simulations to improve patient safety

We developed a prototype using immersive and 2D technologies to allow students to practice a high risk procedure without risk to a live person.

Dr. Carol Dudding
Online Speech-Language Pathology

jmUDESIGN

4-VA has proudly supported jmUDESIGN for 8 consecutive years toward their initiatives for teaching instructional design and redesign processes.

2019



Institutions Represented

1. George Mason University
2. James Madison University
3. Lord Fairfax Community College



Participants



Next generation energy storage devices

We succeeded in performing measurements on much smaller scales than anticipated, which was exciting news for us and saved us a lot of time and money.

Dr. Masoud Kaveh-Baghdorani
Physics



Impact of acute and chronic physical activity on adverse outcomes

I was invited to share our preliminary results as part of a symposium on exercise and nutrition interactions, which was a part of the Southeast American College of Sports Medicine annual conference.

Dr. Stephanie Kurti
Kinesiology





We discovered that the mouse brain—which is being used by thousands of investigators worldwide to uncover the genetic causes of intellectual disability—has an organizational feature that makes it more similar to primates and humans than we had originally thought.

Dr. George Vidal
Biology



Finding Autism in the Brain

 2
Publications

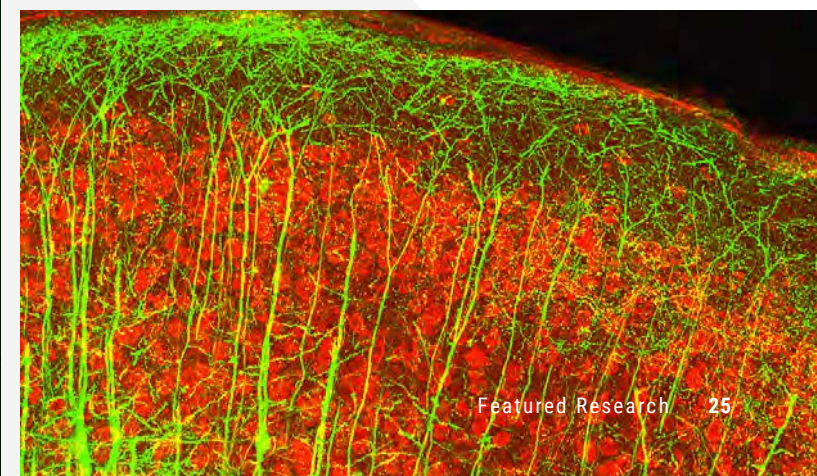
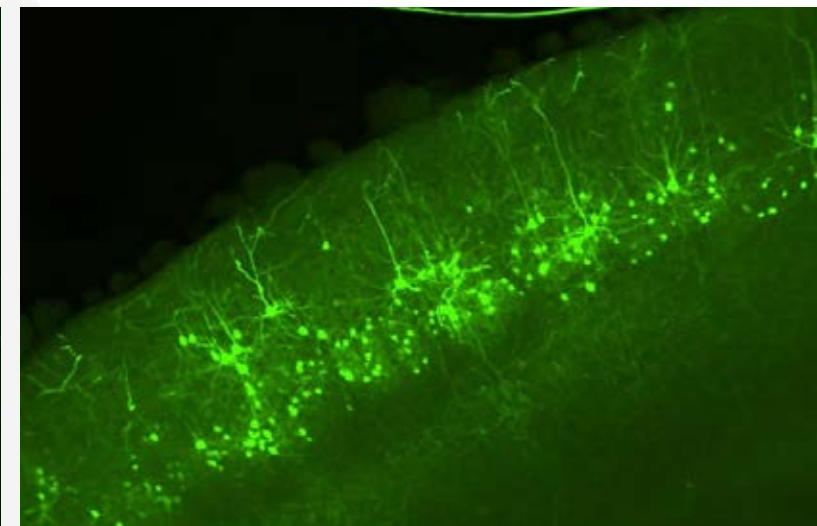
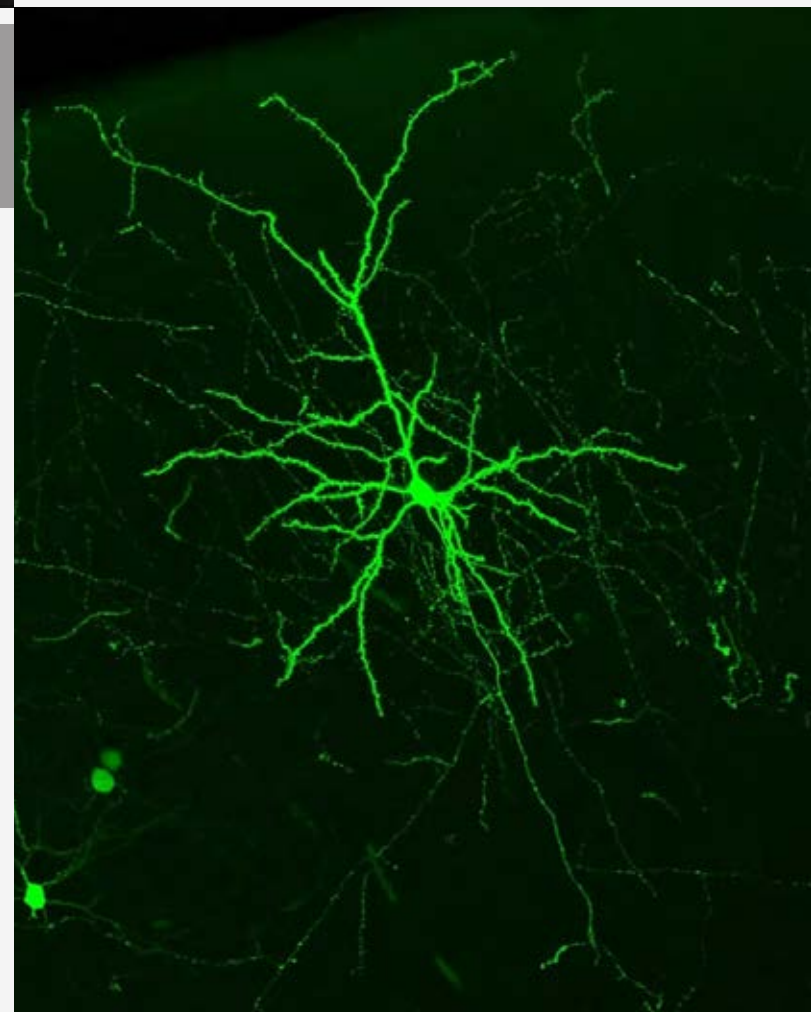
 6
Conferences

 9
Undergraduate Students

Left and top right: Mouse cerebral cortical neurons filled with green fluorescent protein to show cell bodies, dendrites, and axons. Bottom right: Mouse cerebral cortical neurons in green, and an autism-related protein in red.

Top left: Biology major Andrew Lopuch and Dr. George Vidal prepare to introduce DNA into the developing brain of mouse embryos. **Top right:** Biology major Eden Widener prepares a mouse brain for histological analysis. **Bottom:** JMU alumnus Logan Holley ('19) analyzes the microanatomy of a mouse cortical neuron with a confocal microscope.

4-VA awarded Dr. George Vidal two collaborative grants to establish a research partnership with Dr. Michael McConnell at UVA to focus on the genetics of neurodevelopmental disorders, including autism and schizophrenia. Through the project, JMU undergraduate students and UVA graduate students have been advancing the forefront of knowledge about intellectual disability and the development of the brain.





Patrice Ludwig teaches a class in Cartagena.



“ Throughout the trip we realized that there is significant potential for partnerships between UTB and JMU. UTB has a strong interest and expertise in social and cultural innovation, which fits in well with JMU’s engagement mission and the growing repertoire of classes that JMU X-Labs is beginning to offer every year.

Dr. Patrice Ludwig
Biology



Partnering with Colombia

Sharing the JMU X-Labs model of education

The plan is for JMU and UTB to teach parallel sections of the Community Innovations course using the spring 2019 model as the prototype. The faculty is working on a case study of the project on multiple levels including faculty engagement, student engagement, and student learning and will present their findings at an international conference.

Although working across continents is uncharted territory for the program, it’s a great opportunity to implement JMU X-Labs’ vision of sharing courses. A parallel international program will be exponentially more challenging with language, technology, culture, and many other as yet undefined variables, but both teams are motivated to face these issues with the potential student benefits in mind.

Below left: Patrice and Seán pause in front of the Cartagena skyline. **Below top right:** Oriana and Patrice design a parallel course between UTB and JMU. **Below bottom right:** Seán and Patrice taught a design thinking and social innovation workshop to undergraduate business students.

When Professor Oriana Susana Martínez Palomino from the Universidad Tecnológica de Bolívar (UTB) in Cartagena, Colombia learned about JMU X-Labs, she was intrigued by the transdisciplinary programs it offered. Oriana and her team at UTB were very interested in bringing collaborative, project-based methods to their classes and research, and JMU X-Labs offered a model that looked like a perfect fit.

Meanwhile, Dr. Patrice Ludwig (biology), Dr. Erica Lewis (nursing), and Dr. Seán McCarthy (WRTC) from JMU have been researching JMU X-Labs’ unique model of education, its effectiveness, and its impact on both students and faculty. With the program’s pilot Community Innovations course (p. 12) and UTB’s similar interest in solving community challenges, the two institutions formed a natural partnership.

Since then, JMU X-Labs has been working with UTB on several collaborative student projects, visits, and short-term exchanges. Two faculty members from UTB visited JMU X-Labs in September and asked that JMU send a training team to visit them in November so that they could prepare for a shared class between the institutions. Seán and Patrice volunteered to make the trip, which involved long days, planned and impromptu training and judging student projects.





Andrea Pope presents at the conference.



Morgan Crewe presents her segment.



Statewide Assessment Conference

 168
Participants

 31
Universities

 15
Community Colleges

In April of 2019 the Virginia Assessment Group hosted a spring drive-in telepresence conference called "Telling our stories: Using assessment data for learning and improvement." Dr. Jeanne Horst worked with a group of assessment professionals around the state to organize the one-day conference which was funded by a 4-VA collaborative research grant.

The event was a hybrid conference where participants drove to regional locations to meet with colleagues at one of six locations: GMU, JMU, ODU, UVA, VCU (Cisco Headquarters) and VT. Participants at each location then met virtually with participants from the other locations via 4-VA telepresence technology. The 168 conference registrants represented 50 organizations: 31 universities, 15 community colleges, and 4 professional organizations.



“Virginia is a large enough state that even if an event is held in a geographically central location, some people will need to stay overnight in order to participate because it's too far to travel there and back in a day. The Virginia Assessment Group/4-VA drive-in provided about the best balance I can imagine between a webinar and a traditional statewide conference, effectively leveraging the benefits of each of those kinds of events.

Dr. Jodi Fisler
Associate for Assessment Policy and Analysis
State Council of Higher Education for Virginia



“Having a free event and cutting down on the necessary travel distance is extremely important for ensuring folks with less funding still have access to high-quality professional development.

Caroline Prendergast
Doctoral Student in Assessment and Measurement

Kevin Borg introduces the project at Brothers Craft Brewing.

Archiving Prohibition



“ This project is demonstrating the value of interdepartmental and campus/community cooperation for JMU graduate humanities training.

Dr. Kevin Borg
History



1. The Cohen Center for the Humanities
2. Department of History
3. Exploring Rockingham's Past (ERP)
4. JMU Libraries
5. Rockingham Circuit Court
6. School of Writing, Rhetoric and Technical Communication

Below: Clerk of Court Chaz Haywood, history graduate student Craig Schaefer and WRTC graduate student Philip Meador presented the prohibition records project at Brothers Craft Brewing in April 2019.



3 Undergraduate Students



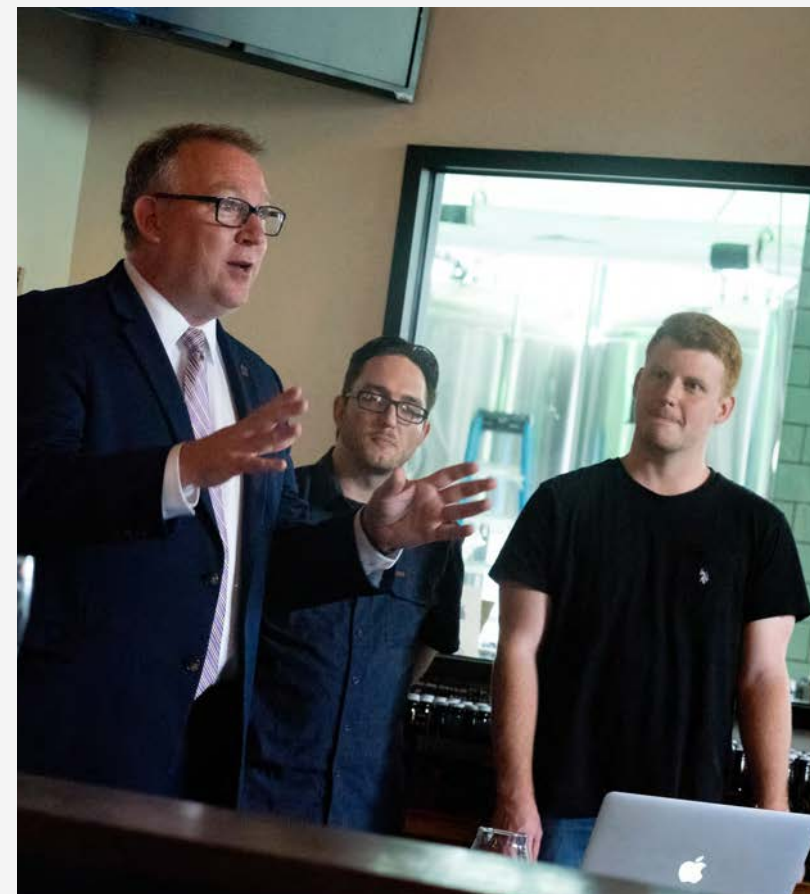
6,300+ Documents



3 Graduate Students

In 2018, 4-VA awarded a grant to Dr. Kevin Borg to help his team catalog, digitize, describe, and upload over 6,300 documents to the JMU Libraries' system. The records cover the prohibition of alcohol in Rockingham County between 1910 and 1933, and can be found at <https://sites.lib.jmu.edu/prohibition/>.

In April 2019, the team revealed the collection to the public at Brothers Craft Brewing in Harrisonburg and encouraged the community to explore the area's history on the new website. The public-private partnership between the court clerk, community members, and students not only added value to the research, but it also garnered a lot of attention in the surrounding communities and was featured in *Augusta Free Press* and *JMU News*.



2018-2019 Events

JMU X-Labs staff members organize events that promote scholarship across campus, outreach in the community, and engagement with students of all ages—from STEM day events at local K-12 schools to Lifelong Learning Institute workshops.

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. In addition, students and faculty showcase their research and solutions to the public at major events, such as the end-of-the-semester summit and symposium.



4

Full-time employees



2,300+

Participants

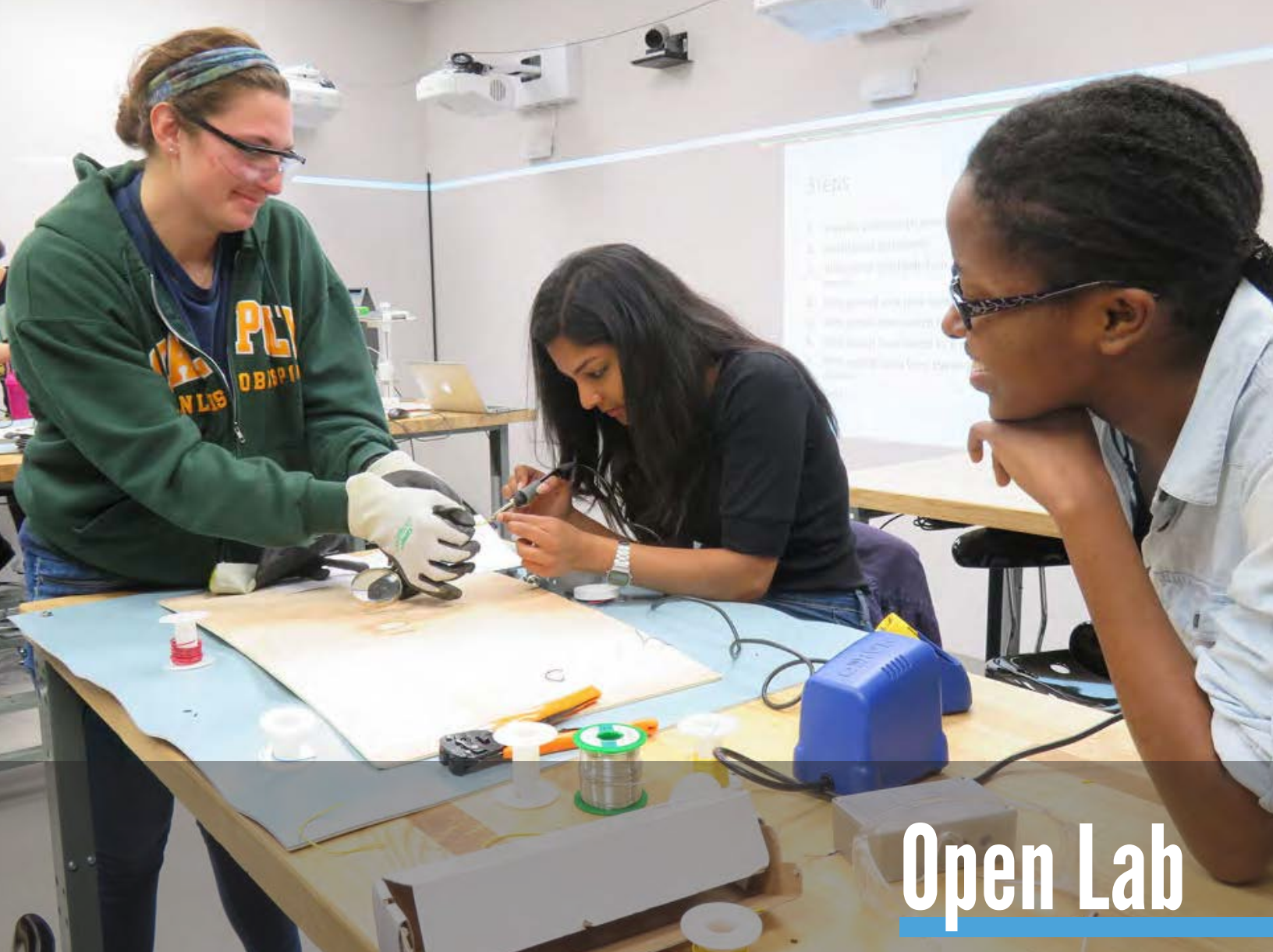


50+

Events

- 1787 August Orientation for freshmen
- Alumni workshops for Bluestone Reunions
- Annual Symposium
- Bluestone Hacks hackathon
- Fab Lab
- Innovation Summit
- Open Lab
- Pop-Ups
- CHOICES tours for prospective students
- Departmental workshops
- UPB Late Night Breakfast
- Lifelong Learning Institute workshops
- Sibs and Kids Day
- STEM day events at local K-12 schools
- Talent Development workshops





Open Lab



Faculty and community members visit the lab to work on various projects.




Students use the vinyl cutter to make JMU decorations.




Students use the laser cutter to engrave personal items.

During Open Lab, equipment and supplies are available to students, faculty, staff and community members. Common projects include laser cutting, glass etching, soldering, sticker making, button making, milling, virtual reality, and 3D printing.

 **55+**
Majors

 **1,650+**
Projects per semester

 **25+**
Students Daily

“There’s a sense of accomplishment and pride in being able to create something yourself. Watching nurses learn to code and engineers learn the importance of clear communication techniques is inspiring and crucial in their growth as students and their future value to employers.

Aaron Kishbaugh
Lab Manager





Innovation Summit



Annual Symposium

Each semester, the JMU X-Labs Innovation Summit brings together students from all courses to display and present their final projects to administrators, client partners, family and friends.

Fall 2018 Classes

- Augmented/Virtual Reality
- Autonomous Vehicles
- Blockchain
- Community Innovations
- Creativity and Innovation
- Hacking for Diplomacy
- Internet of Things
- Medical Innovations

Spring 2019 Classes

- Augmented/Virtual Reality
- Autonomous Vehicles
- Community Innovations
- Drones
- Fueled food truck
- Furious Flower
- Hacking for Defense™
- Robotic Process Automation



The Annual Symposium in 2018 featured a welcome by President Jonathan Alger and presenters were introduced by Tamara Hatch.

Presenters

- **Dr. Erica Lewis**, Nursing
- **Dr. Louise Temple**, Integrated Science and Technology
- **Dr. Stephanie Kurti**, Kinesiology
- **Dr. Elizabeth Edwards**, Kinesiology






Students learned the different methods of brewing coffee at a Pop-Up sponsored by Black Sheep Coffee.



Students practiced henna art, an ancient form of self-expression and body adornment at a Pop-Up with SKS Artworks.

JMU X Labs
Pop-Ups

 **12 Local Partners**

 **58/58**
Majors Represented

 **1,421**
Participants

Pop-Ups are free, non-credit workshops for students, faculty, and community members. Taught by JMU X-Labs staff, students and community experts, these make-and-take classes are an opportunity to try a new skill, practice using equipment, and have fun. Pop-Ups reach an average of 90 students a week and offer low-barrier access as a way to introduce them to design thinking and to help them generate creative and innovative ideas and solutions.





Pumpkin Palooza



T-shirts



Ornaments



Tote bags



Grad caps



JMU pennants



Lasercut keychains



Tassel jewelry

Pop-Up Topics



Creative Passions Coalition painting class



Welcome mats



In January more than 300 students attended the second annual women's event at JMU X-Labs to explore resources and equipment and to design and create personalized decor using the lab's technology.

2019 Sponsors



2019 Features

- Airbrushed tattoos ⚡
- DIY jewelry holders
- Door prizes ⚡⚡
- Facials ⚡
- Henna art ⚡
- Liquid nitrogen ice cream ⚡
- Tassel jewelry
- Glass-etched mason jars
- Lasercut door signs
- Macrame
- Sugar scrubs ⚡
- Tote bags
- Volunteers ⚡



“What surprised me about Fab Lab was the quality of the Pop-Ups and how smooth everything went given the size of the event. It really exceeded my expectations.

Lauren Crebbs
Nursing



“What I loved most about this event is the female empowerment with STEM. I've never felt comfortable with science or labs but this made it fun!

Emma Holleran ('19)
English



Outreach



JMU X-Labs met the demand of over 35 tour and workshop requests from the community during the 2018-2019 academic year.

JMU X-Labs proudly serves the broader community, bringing people together from all majors, all ages and all walks of life.

- 1787 August Orientation for freshmen
- Alumni workshops for Bluestone Reunions
- CHOICES tours for prospective students
- Departmental workshops
- Late Night Breakfast
- Lifelong Learning Institute workshops
- Onsite middle school workshops
- Sibs and Kids Day
- STEM day events at local K-12 schools
- Talent Development workshops
- Tours for international delegates, entrepreneurs and students from the following countries:
 - China
 - Colombia
 - Kosovo
 - Romania



JMU X-Labs hosted a workshop for members of the JMU Lifelong Learning Institute.

2018-2019

Featured Outcomes

Our programs are known primarily for their innovative research, transdisciplinary (multidisciplinary and project-based) nature, and design-thinking approach to real problems.

So what are the benefits of this methodology of learning?

We've witnessed positive results for students, faculty, the community, nonprofits, businesses and government organizations alike. And we're not the only ones. This year *The Chronicle of Higher Education* featured JMU X-Labs on the front page of the February edition (p. 48) and AT&T provided generous financial support for our programs (p. 50).

On top of that, undergrads are working on cutting-edge research, collaborating with top researchers at other state institutions, contributing meaningful solutions to society before graduating and subsequently getting into top graduate programs and landing rewarding positions at esteemed companies and organizations. It's a win-win situation because these institutions and employers get new graduates who already have experience with the latest research and solving difficult problems.





THE CHRONICLE
of Higher Education

Front Page News



Left to right: Sophia Kaleem (a sophomore in accounting), Shaylee Vargas (a senior in interdisciplinary liberal studies), Madi Schultz (a senior in justice studies), Lindsey McClucas (a senior in writing, rhetoric and technical communication), and Kelly Reynolds (a junior in management) presented their portable health clinic idea from inside a shipping container, which will house the clinic and provide services to underserved communities. Their project was among those featured in *The Chronicle of Higher Education*.

In February 2019, *The Chronicle of Higher Education*—one of the most respected news outlets in higher education—published a five-page article about JMU X-Labs. Featured on the front page, the article, written by Senior Writer Beth McMurtrie, provided an in-depth view of the program and its impact on students.

“Now a nurse working in Washington, D.C., [Emma] Richer reflects on a day when a patient went into cardiopulmonary arrest. Although only 23 at the time, she says, she was able to take charge of the situation to get a team in place to revive the patient. She credits her [JMU] X-Labs experience for helping instill that confidence.



Emma Richer (Nursing, '17), as quoted in the February 15, 2019 issue of *The Chronicle of Higher Education*, p. A18.

“I owe JMU X-Labs, like, 97 percent of my success for the rest of my life.



Nick Sipes (Physics, '17), as quoted in the February 15, 2019 issue of *The Chronicle of Higher Education*, p. A18.



Industry Support



In early 2019, AT&T awarded JMU X-Labs \$25,000 in support of the overall program and the spring Innovation Summit.



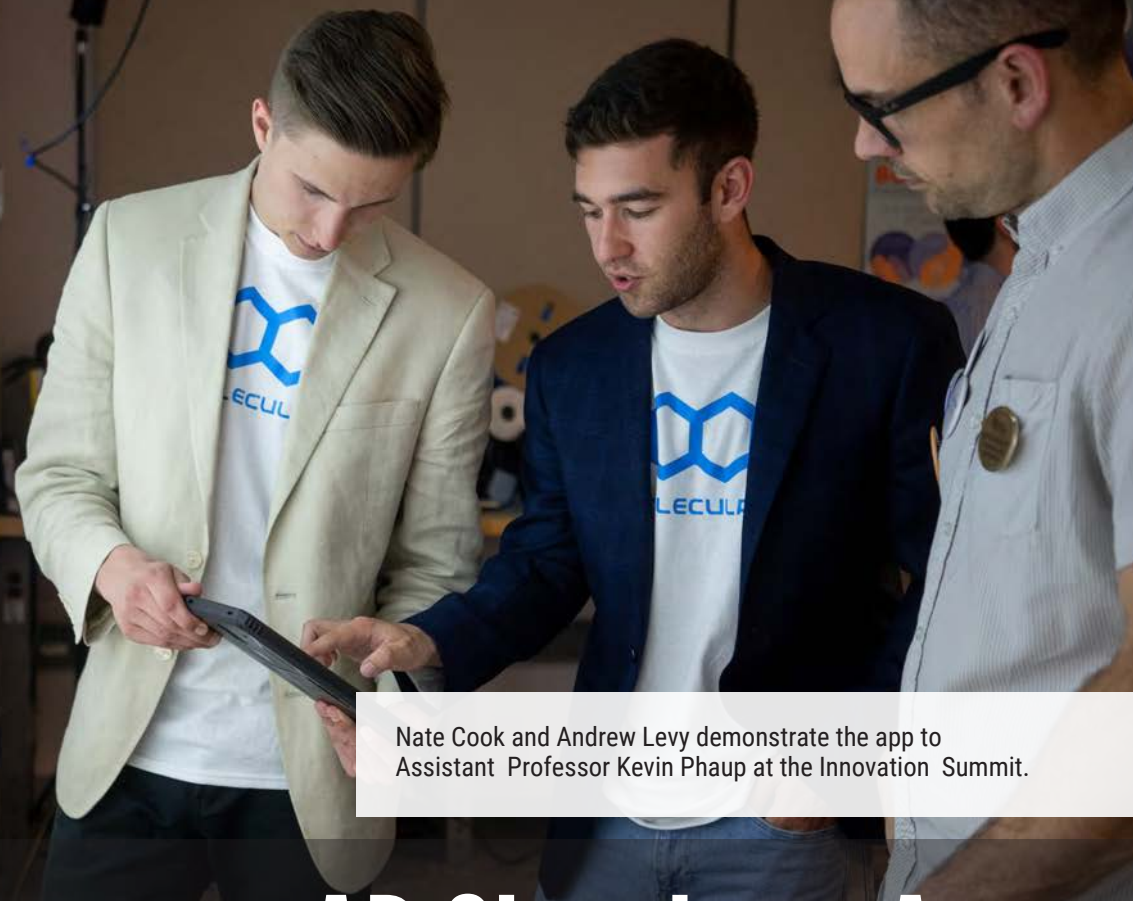
“ We work with universities and other organizations to give the next generation of tech leaders and innovators hands-on opportunities that prepare them for success. Through JMU X-Labs, JMU students are developing technology solutions to real-world challenges across many areas— from community and social services to arts and culture to national defense.

After our very first visit, we were impressed by their vision and plans for the program, which is why we're excited to support the great work being done at JMU X-Labs.

Vince Apruzzese
President, AT&T Virginia

The following companies made generous contributions of equipment or financial support to JMU X-Labs during the 2018-2019 academic year:

- Hi-Tech Hobbies – \$42,000 in-kind
- TSSi – \$19,000 in-kind
- Unconventional Concepts, Inc. – \$2,500



Nate Cook and Andrew Levy demonstrate the app to Assistant Professor Kevin Phaup at the Innovation Summit.

AR Chemistry App

With the combined expertise of Dr. John Gilje from the Department of Chemistry and guidance from Augmented/Virtual Reality (AR/VR) Instructor James Barnes, a team of students from 4 different majors started a project during the spring AR/VR class. The project focused on creating an AR app that enhances how chemistry is taught in the classroom. In order to continue development, the team did a group independent study, which included testing their latest designs on 49 freshmen chemistry students for feedback and improvements.



“Our project is an augmented reality chemistry app that we hope will eventually replace students' need for large, bulky and expensive models used in classrooms to visualize molecules at an atomic level, while also aiding students with interactive features and animations.

Jordan Crowe
Computer Information Systems



VR Mobile Tour

Undergrads present at EDUCAUSE conference

In February, Zack Allen (computer science and geographic information systems) and Thomas Knupp (computer information systems) traveled to Anaheim, California, where they were the only undergraduate students to present at the EDUCAUSE Learning Initiative annual conference. Billed as "the premier gathering of higher education teaching and learning professionals," the three-day gathering focused on solutions to key issues, engaging with innovative technology and service providers, and networking with colleagues.



The students developed a mobile version of a virtual reality tour for the JMU Center for Global Engagement to give prospective students abroad a feel for the campus. The JMU Office of Admissions uses the kiosk version of the VR tour to recruit new students and it's the only one of its kind developed entirely by undergraduate students.



VR Medical Simulations

A multidisciplinary team of students and faculty developed a virtual reality application that allows healthcare students to practice nasal endoscopies without discomfort or harm to patients.

In 2017, Dr. Carol Dudding, the director of the Online Speech-Language Pathology Program reached out to Augmented/Virtual Reality (AR/VR) Instructor James Barnes at JMU X-Labs and Assistant Professor Kevin Phaup from Industrial Design, to discuss the possibility of working together on medical simulations.

In the spring of 2018, they received a collaborative research grant from 4-VA called Immersive Virtual Reality Simulations to Improve Patient Safety to develop a prototype and test their ideas. That summer they participated in jmUDESIGN to create a course in AR/VR medical simulation design at JMU X-Labs, which was successfully piloted in the spring of 2019 and became the first undergraduate course of its kind in the country.



Booz | Allen | Hamilton

Celine Gomes

International Affairs, '19



“Our problem sponsor was the Department of State's Bureau of Counterterrorism and Countering Violent Extremism. My team and I developed a tool with both online and offline capabilities to prevent the radicalization of youth, specifically targeting 14-16 year-olds, across the Middle East and North Africa. We were honored to have been invited to present our project (<https://bit.ly/2LEVGYj>) to the Department of State in Washington, D.C., and they loved it!

Employers were always incredibly impressed with the multidisciplinary facet of the class, and were blown away by the project I worked on and the solution my team and I created, especially given that I'm only an undergraduate student. It's such a unique class and that enabled me to really sharpen my own versatility and my aptness to conquer any challenge. I found that most interview conversations always circled back to this class.

“I found that most interview conversations always circled back to this class.”

I'm awestruck just thinking about my upcoming position as a software engineer at Booz Allen Hamilton. It's completely outside of anything I've ever taken on before—and I'm ready. I wouldn't be where I am today without JMU or the Hacking for Diplomacy class. Go Dukes!



BMNT

H4X[®]
BMNT's proven approach to problem-solving



p. 58

In 2015, Stanford University and BMNT started the Hacking for Defense (H4D) program where graduate students solve national security problems. One year later, JMU became the only university to participate in the program with undergraduate students. JMU X-Labs evolved the program to include diplomatic matters through Hacking for Diplomacy (H4Di) and community issues through the Community Innovations class.

The overall program continues to grow domestically and internationally, with Australia and England recently adding H4D programs. JMU X-Labs was asked to help train the new faculty team in England, and at the direction of the Stanford team, new schools considering the program have visited JMU to learn how to set up the program.

i Hack – to improvise effectively; to take things apart and repurpose them to solve problems or create new products

3



Other outcomes

- 1 In 2018, students from JMU were asked to present their "Hacking for" class experience at a Congressional hearing in Washington, D.C., alongside students from Georgetown University, Columbia University and The Defense Acquisition University.
- 2 A team of JMU students from the fall 2018 Hacking for Diplomacy class came up with a solution that was so impressive, they were asked to present their idea to a NATO think tank of 4-star generals in Split, Croatia in March 2019 (p. 58).
- 3 Through H4D programs, JMU is now in the company of universities like Columbia, Georgetown, Johns Hopkins and Stanford.



A NATO Solution

Students present to NATO in Croatia

On March 25, 2019, three undergraduate students presented their team's deployment solution to NATO officials at a TIDE Sprint in Split, Croatia. Anne Uitvlucht, Elizabeth "Cole" Thomas and Danielle Kratowicz were part of a five-member team of undergraduates that developed a "Decision Forcing Exercise" (DFE) for NATO during the fall 2018 Hacking for Diplomacy class at JMU X-Labs.

According to their project website, "The main goal of First ACT's DFE is to replicate scenarios in which many relevant facts cannot be ascertained with certainty in a



TIDE (Think-Tank for Information, Decision and Execution Superiority) Sprints promote developments and innovation to improve interoperability between NATO and its partner nations.

timely manner, and force participants to rapidly but responsibly hasten the process by which they make decisions that ultimately get the logistical ball rolling."

Dr. Bernd Kaussler, one of the Hacking for Diplomacy professors said, "I am proud of them as this is a great opportunity for our students to showcase their work and share how they suggest to apply their concept and ideas into improved decision-making."



"I started work this week at Politico and more times than I can count they've brought up the importance of innovation and I've been able to capitalize on Hacking for Diplomacy, again. What was the most stressful, difficult thing at the time has paid off tenfold!

Cole Thomas ('19), Political Science, 7/11/2019



You don't think as an undergrad you'll be given such an opportunity [to work on a product for an international organization], but we were—thanks to Hacking for Diplomacy and JMU X-Labs.

Anna Uitvlucht ('19), International Affairs



This is the first class where I felt like I was pushing myself to my limits and making an impact on an important organization.

Danielle Kratowicz, Accounting





Intel Hackathon

Defense Contractor Partners with JMU X-Labs for Competition



Because of its classified nature, the U.S. Intelligence Community faces a challenge recruiting undergraduates with both technical expertise and security clearance. To meet this need, Cameron Hunt, the CEO of a defense contractor in North Carolina reached out to JMU X-Labs.

Hunt worked with JMU X-Labs Director Nick Swayne and Fred Briggs, an instructor of the JMU X-Labs Drones class, to develop a 24-hour competition that tested students' creative and technical skills and provided an opportunity for paid summer internships. The JMU X-Labs team invited students from several of their transdisciplinary classes, including Internet of Things, Drones, and Autonomous Vehicles. Swayne also contacted Addison Hagan from the Virginia Military Institute (VMI) Foundation, who coordinated with the Department of Engineering and administrators to get approval for student participation from VMI.

Twelve JMU students spent the first day of their spring break developing functional devices in just 24 hours. Using a Raspberry Pi—a single-board computer—along with cameras and sensors, students from both universities were tasked with creating a prototype

that could count the number of people walking past a designated area, but with a catch—their device needed to be accurate enough to avoid counting the same person twice.

The top team from JMU placed third overall and the sponsors of the competition were pleased with the students' skills and abilities.

“The event was very successful,” Hunt said. “It helped my client understand just how powerful these kinds of events can be, and they are interested in seeing which students are willing to do onsite, summer internships. I expect that my client will be interested in exploring ways to make this kind of event a cornerstone of their tech talent recruitment pipeline.”



“I felt confident enough to sign up because of the class work I had already been doing with robotics, problem-solving and programming.”

Alexandra Trembl
Integrated Science and Technology



Teresa and her team present their Hacking for Defense solution to the public.



Teresa Cummings

Writing, Rhetoric and Technical Communication
Modern Spanish Language ('19)



“JMU X-Labs provided me a unique opportunity to not only experience working on a diverse team, but also the opportunity to learn and think outside of my own discipline. Additionally, JMU X-Labs had me working with REAL clients and REAL problems. Not many students can say that they conducted 100 interviews with subject matter experts, developed a minimal viable product, presented that product to a living, breathing client, and worked with fields opposite their own (i.e. thermal engineering with writing, rhetoric and technical communication).”

I gained a wide network of industry mentors after my first JMU X-Labs class. Many of the people my team and I interviewed keep in contact with us today. Beside a network of professionals who are interested in my education and professional development, the class also gave me the unique opportunity to connect with other colleges and universities. I've been interviewed and maintained contact with a few people from universities like Georgetown, Columbia, and Stanford. I still get the 'How's school?/What project are you working on now?' LinkedIn messages.



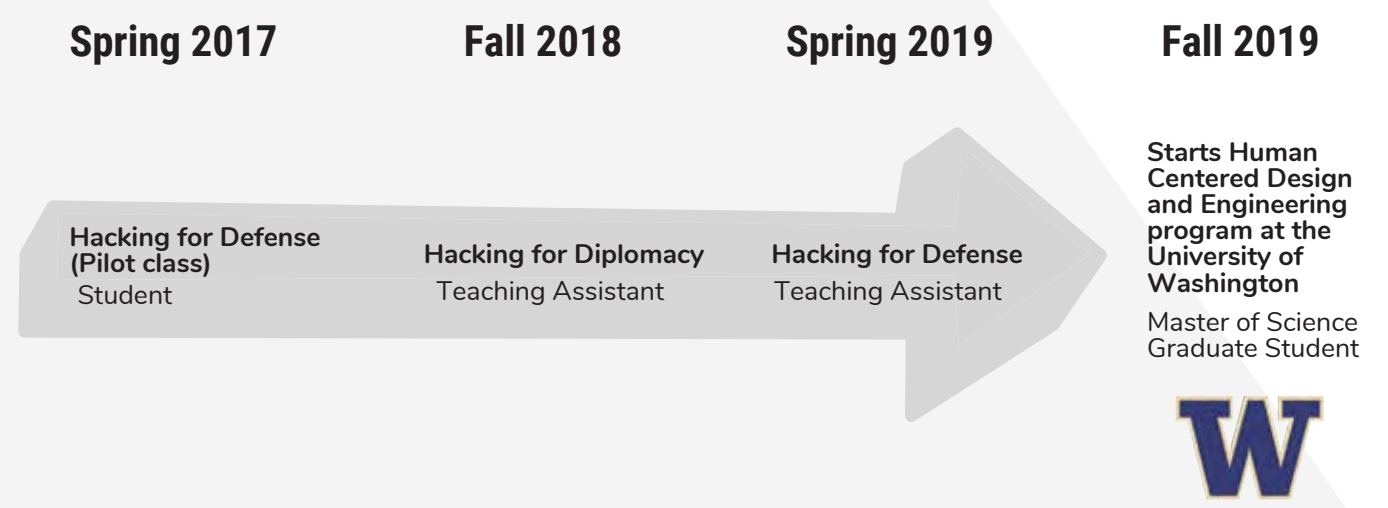
The University of Washington's Master of Science in Human Centered Design & Engineering (HCDE) prepares its graduates for leadership roles in user experience research and design, interface design, interaction design, product design, and human-computer interaction.
– <https://www.hcde.washington.edu/ms>

From the time I spent at JMU X-Labs, I observed that its mission is to change how problems faced in various communities, like the military, local, or even homeless communities, are approached and solved through multidisciplinary work. In essence, this program and the classes offered at JMU X-Labs rely on involvement from students across all of JMU's campuses (not just East Campus or Miller Hall) and their willingness to step out of their fields' comfort zone and listen and work with others different from themselves. And this is not easy to do, especially for the students who believe that their discipline is the omniscient, omnipotent discipline all others should follow. The key for any program like JMU X-Labs and the University of Washington's Human Centered Design & Engineering (HCDE) program to flourish and cause an impact is collaboration across diverse fields. Collaboration with and by everyone involved in the project(s) determines if real impact will be made. I believe this understanding, paired with the essential fact that these solutions are made for users—for people—assisted me in receiving an offer for the UW HCDE program.

The Human Centered Design & Engineering (HCDE) program at the University of Washington is highly competitive.



My advice to current and incoming JMU undergrads? Take a JMU X-Labs course. Step foot in the building, even if its only for a Pop-Up class or hackathon workshop. Take a course if you can and buckle up. These classes will not be “easy,” they will be challenging, but they will help you grow as a student, as a professional, and as a person. Learn through experience at JMU X-Labs with cool technology, challenges, and your fellow Dukes. Learn how to fail, so you can then succeed.”



As a result of a 4-VA collaboration between JMU and UVA, Hans Olson (center, sitting) is now a PhD student at UVA and member of the Experiments and Simulations in Thermal Engineering (ExSiTE) Lab, under the tutelage of Patrick Hopkins (far left).



Hans presents his poster at the 2016 National Conference on Undergraduate Research.



Hans celebrates with his brother and sister on graduation day.



David Hans Olson

Physics ('16)



Hans (sixth from left) also competed with the JMU men's club gymnastics team, pictured here at the team formal.



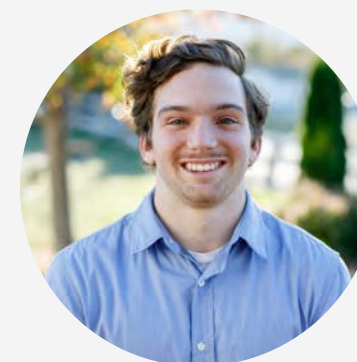
Dr. Costel Constantin
Physics

“Because of 4-VA, Hans was able to work in my lab and go straight from a bachelor's degree into a PhD program. He is a top student and an exceptional individual!”

Back in 2013, Dr. Costel Constantin from JMU started a 4-VA collaboration project with Dr. Patrick Hopkins at UVA. Shortly after that, David "Hans" Olson, an undergraduate student at JMU, joined the team and built relationships with other researchers while gaining experience in materials science. Little did Hans know how much the experience would influence the trajectory of his life.

After Hans graduated summa cum laude in 2016 with a Bachelor of Science in physics, a concentration in fundamentals and materials science, and minors in both mathematics and computer science, Costel suggested he apply to graduate school. Inspired by Costel's recommendation, Hans applied to the doctoral program in the Department of Mechanical and Aerospace Engineering at UVA and was accepted just two weeks later. He also received the prestigious Virginia Commonwealth Fellowship for his first year, the Virginia Space Grant Consortium (VSGC) Fellowship for his second and third years, and the highly competitive National Defense Science and Engineering (NDSEG) Fellowship for his third, fourth and fifth years.

Now Hans is part of Patrick Hopkins' Experiments and Simulations in Thermal Engineering (ExSiTE) Lab at UVA where he contributes to cutting-edge research in the field.



“It's very exciting to see all the hard work I performed during my undergraduate career pay off. The physics program at JMU prepped me well for graduate school, and definitely set me apart from other candidates based on my invaluable research experiences at JMU.”

Costel has had a pretty significant impact on my career. As a physics major, I enrolled in the introductory materials science course, co-taught by Costel. I realized that I wanted to further delve into the world of materials science, and performing research with Costel was the way to go. It allowed me to travel to conferences and present my research, opening up opportunities for graduate school. The experiences I had working in Costel's lab were invaluable for graduate school, and gave me an upper hand on the other candidates. Costel has also been an integral part in my career during graduate school, writing a letter of recommendation for my NDSEG fellowship, which will continue to fund me for the duration of my time here, as well as continuing to perform research through collaborations with our group.”



Student Interns



Jessica Maroney helps students make laser-cut cornhole boards for Sibs & Kids Day.



Lexy Foor, Miranda Landmann, and Madison Carrillo lead the Pumpkin Palooza Pop-Up in front of Wilson Hall.



Cassidy Welch helps Fab Lab participants make laser-cut DIY jewelry holders.



Lexy Foor demonstrates how to use vinyl-cut stencils for glass-etching.

- Madison Carrillo** Communication Studies, junior
- Lexy Foor** Biology, senior
- Miranda Landmann** Kinesiology, freshman
- Jessica Maroney** Writing, Rhetoric and Technical Communication, junior
- Cassidy Welch** Media, Arts and Design, senior

In 2018, JMU X-Labs hired its first cohort of student interns to help with marketing, event planning, coordination and strategic development. Each one of the interns brings a unique skill set to the team and provides leadership in the lab by developing and running Pop-Ups and campus-wide events for students, faculty, staff and community members.

“What has surprised me most about working at JMU X-Labs is the vast impact that we have on the Harrisonburg and JMU community. We really bring the community together as we connect different clubs, organizations, and small businesses.

Miranda Landmann
Kinesiology



“My favorite Pop-Ups are the ones where we partner with local businesses. I love being able to learn more about their business and who they are.

Cassidy Welch
Media, Arts and Design



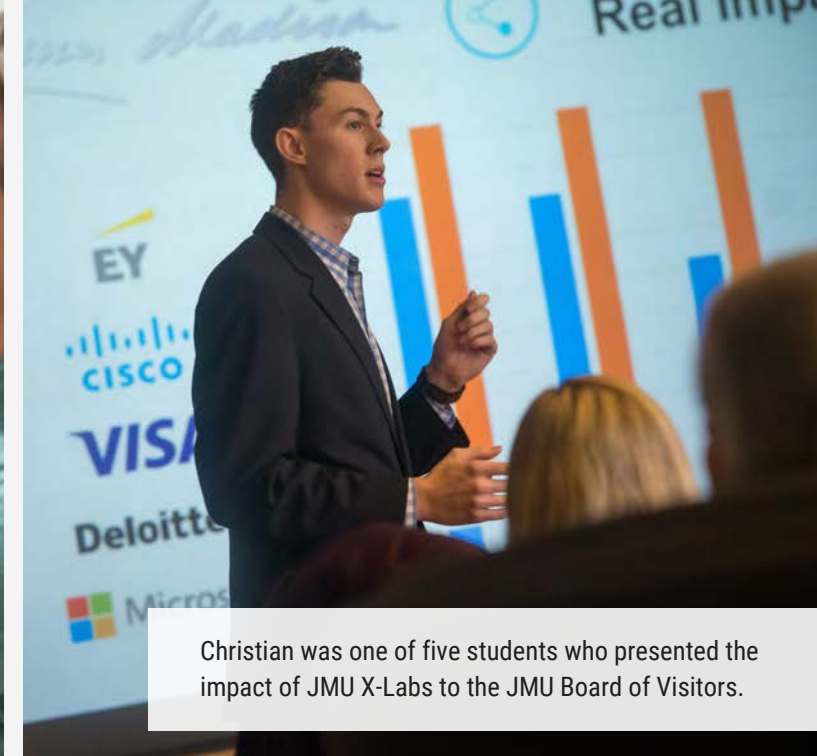
“As a communications major, it was intimidating coming in the lab, but now I am proof that anyone can come master the technology we offer.

Madison Carrillo
Communications Studies





Christian and other students in the Augmented/Virtual Reality class set up the 360-degree camera.



Christian was one of five students who presented the impact of JMU X-Labs to the JMU Board of Visitors.

Christian Caruso

Business Administration
Computer Information Systems ('19)



“JMU X-Labs has had an incredible impact on my life because it allowed me to take ownership of my education. For the first time, my perspective and feedback on the curriculum, the content, and the course was heard by the professors. We worked in partnership with industry experts, so we could focus on solutions that had real impact rather than just getting a grade for our work. Also for the first time, I felt that I was making an impact on my community because the problems and curricula focused on issues that affect people in Harrisonburg and around our country.

Becoming a student at JMU X-Labs allowed me to better understand myself—my strengths and my weaknesses, and it taught me how to better communicate with others. The lessons and skills I learned helped me to secure internships at one of the Big Four accounting firms, and it is what allowed me to secure my current position after graduation at Capital One in their CODA Program as a Full Stack Software Developer Associate.

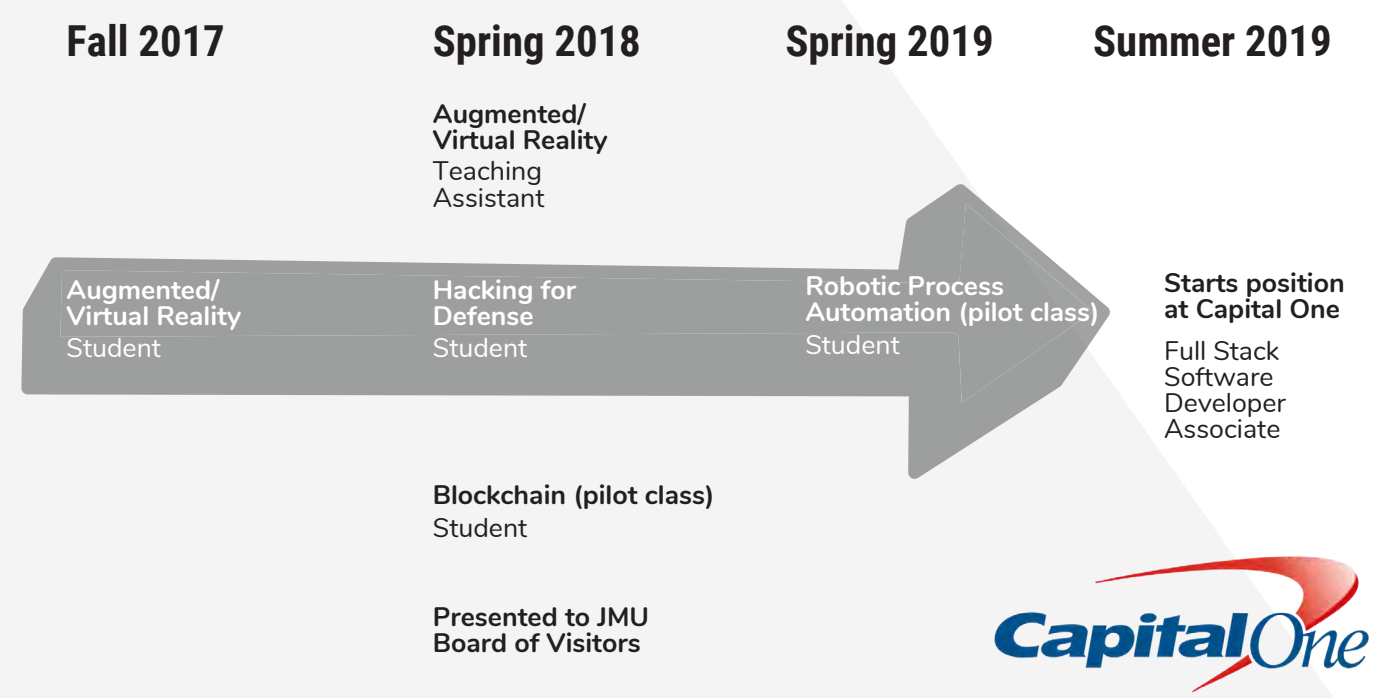
I believe that project-based experience set me apart from the competition, as I spent probably 85% of my interviews with Capital One talking about my JMU X-Labs classes. I talked about solving problems for which there are no known solutions, learning a shared language of problem-solving that transcends any specific discipline, and how critical it is to work with others from diverse backgrounds of experience. I believe that all of the aspects and experiences I gained at JMU X-Labs were exactly what my employer was looking for.

“I spent probably 85% of my interviews with Capital One talking about my JMU X-Labs classes.”

There is a certain energy you feel when you walk into the lab —when you hear the 3D printers in the back, when you smell the laser cutter printing fresh designs, and when you see the collaboration between students and faculty. This environment stimulates creativity and passion. JMU X-Labs is a place where anything is possible and the word ‘No’ doesn’t exist. That, is my favorite part of JMU X-Labs.



To anyone reading this, get involved with JMU X-Labs programs! If you are a student, enroll in the courses or take a Pop-Up class. If you are a faculty member or professor, see how you can get involved as an instructor. If you are a community member or industry expert, reach out for a partnership! JMU X-Labs is the future of education, and working together I know we will be able to change the way we learn now, and for years to come!”



Bike-Powered Blender

As part of a class project for the spring semester, Fueled Student Director Alex Young ('19) built a bike-powered blender, demonstrating two of the program's values: health and sustainability. By upcycling old bicycle parts, the finished product converts muscle exertion into mechanical energy, resulting in a tasty blended beverage.

The project faced several design challenges—how to link separate gear hubs, how to rotate the gear plane, and how to keep the whole construction compact enough for aesthetics and function.

With help from Lab Manager Aaron Kishbaugh and support from Fueled Co-Director Emma Christie and Aramark Sustainability Manager Amanda Presgraves, Alex was able to unveil his machine in honor of Earth Day.



“Aaron's unconditional support and drive to see the project succeed has been incredible and I hope everyone pursues the chance to see what they can accomplish with some help from him.

Alex Young
Justice Studies





Coming 2019-2020



The space transitioned from a WVPT storage room into the newest JMU X-Labs classroom.



New 4-VA Member Institutions

Both the Virginia Military Institute and the College of William & Mary have applied to become the newest members of 4-VA and are expected to join the partnership over the summer of 2019. Their membership will further the 4-VA mission to promote collaborations that leverage the strengths of each partner university and improve efficiencies in higher education across the Commonwealth of Virginia.

New Classroom

JMU X-Labs is excited and grateful for the institutional support from Senior Vice President of Administration and Finance Charlie King and Assistant Vice President of Information Technology Dale Hulvey to expand to meet our growth with a new classroom in Lakeview Hall!

Thank You

Industry Support



JMU X-Labs would like to offer a special thank you to **Charlie King** and **Dale Hulvey** for their support of JMU X-Labs and its continuous growth, along with the following supporters:

- Jonathan Alger
- Matt Banfield
- James Barnes
- Mike Battle
- Peter Blake
- Greg Brennan
- Madison Carrillo
- Andy Casiello
- Dean Claud
- Heather Coltman
- Nancy Dauer
- Ben Delp
- Deborah Derden
- Lexy Foor
- Will Fox
- Elizabeth Gillooly
- Marcy Glover
- Eric Gorton
- Tamara Hatch
- Archie Holmes
- Dale Hulvey
- Josh Humphries
- Kaitlin Ilnitzki
- Dick Johnson
- Krystian Jones
- Wendy Kang
- Bernie Kaussler
- Janette Kenner Muir
- Charlie King
- Bob Kolvoord
- David Lamm
- Miranda Landmann
- Nick Langridge
- Erica Lewis
- Nanfei Liu
- Patrice Ludwig
- Jessica Maroney
- Seán McCarthy
- Beth McMurtrie
- John Meck
- Cara Meixner
- Christa Miller
- Mike Miriello
- Deborah Noble-Triplett
- Andy Perrine
- Dale Pike
- Atif Qarni
- John Ryan
- James Shaeffer
- Diana Sharpe
- Nicky Swayne
- Elise Trissel
- Cassidy Welch
- Jim West



AT&T

BAE SYSTEMS

TSSi

 **COMPASS**



Administrative Team



Nick Swayne	Executive Director	swaynedd@jmu.edu
Kelsey Hartman	Assistant Director	hartm2kt@jmu.edu
Kim Fisher	Director of Communications	reedyka@jmu.edu
Emily Winter	Director of Programming Lakeview Hall Building Coordinator	winterea@jmu.edu
Aaron Kishbaugh	Lab Manager	kishbaat@jmu.edu



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