



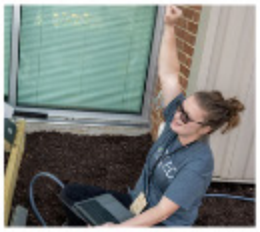


JMU X Labs

4-VA
Advancing The Commonwealth

2017-2018









jmuxlabs.org

4-va.org

Published December 2018

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JMU X-LABS & 4-VA

2017-2018 ANNUAL REPORT

JMU X-Labs is a **cross-disciplinary** program that provides students with **hands-on experience working on real problems with partners in industry**.

At a time when higher education is trying to keep pace with the rapidly changing needs in industry, it is increasingly important to provide students with skills that go beyond traditional expectations. With its multidisciplinary courses, **JMU X-Labs** challenges students to investigate all aspects of a problem, collaborate with industry professionals and peers from different majors, iterate ideas and welcome meaningful failure to solve real problems. Courses are shared across departments and in collaboration with experts in various fields across the country.

4-VA is a collaborative partnership between six Virginia universities* that is powered by 4 initiatives. Its mission is to **promote collaborations that leverage the strengths** of each partner university and improve efficiencies in higher education across the Commonwealth.

*George Mason University, James Madison University, Old Dominion University, University of Virginia, Virginia Commonwealth University and Virginia Tech

SCHEV OBJECTIVES

OBJECTIVE – DRIVE PARTNERSHIPS BETWEEN PRE-K-12, INSTITUTIONS, ECONOMIC DEVELOPMENT AND BUSINESS.

How we're meeting this objective...

- **p. 25** JMU X-Labs classes **partner with professionals** to solve real problems. Read **testimonials** from our industry experts.
- **p. 30** In an effort to align higher education with industry needs, JMU X-Labs hosted the **2018 Virginia Industry Resources Through Undergraduate Education Summit (VIRTUES)** with the aim of fostering **partnerships** that develop creative, confident and market-ready students who are experienced in emerging technologies.
- **p. 32** The Spring 2018 **JMU X-Labs Innovation Summit** featured over 180 students from six courses and 35 different majors who displayed and presented real-world solutions that were developed **in partnership with industry.**

How we're meeting these objectives...

OBJECTIVE – OPTIMIZE STUDENT SUCCESS FOR WORK AND LIFE

- **p. 16** In the fall of 2017, student teams from the JMU X-Labs **Medical Innovations** class designed solutions that address the **opioid crisis.**

OBJECTIVE – FOSTER COLLABORATION AND INNOVATION THROUGH COMPETITIVE GRANTS

- **p. 36** 4-VA provides one-time startup **grants** to JMU faculty for collaborative research with other 4-VA universities, **giving Virginia a competitive edge**.
- **p. 37** 4-VA at JMU has awarded **95+ grants** to faculty from **30+ departments** across campus.

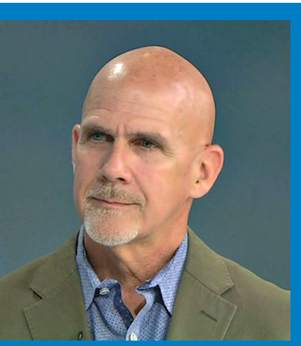
OBJECTIVE – REDUCE TEXTBOOK COSTS FOR STUDENTS BY OFFERING MORE COURSES THAT USE OPEN EDUCATIONAL RESOURCES.

- **p. 17** The JMU X-Labs pilot **Blockchain** class (founded by an undergraduate student) is publishing an open educational resource **textbook** designed to be a comprehensive introduction to the topic of blockchain.

State Council of Higher Education for Virginia

ALIGNING OBJECTIVES

State Council of Higher Education for Virginia



JMU MISSION

WE ARE A COMMUNITY COMMITTED TO PREPARING STUDENTS TO BE EDUCATED AND ENLIGHTENED CITIZENS WHO LEAD PRODUCTIVE AND MEANINGFUL LIVES

How we're fulfilling this mission...

- **p. 10** The JMU X-Labs **Augmented and Virtual Reality** class produced a fully immersive **virtual tour for JMU Admissions** so prospective students and parents can experience the campus using nothing but a virtual reality headset.
- **p. 12** Along with professional drone experts, **70 students from 10 majors and 2 universities** (JMU and ODU) worked together in the **Drones class** to solve **8 pressing ecological problems.**
- **p. 14** Without any prior experience, the JMU X-Labs **Autonomous Vehicles** class turned a golf cart into a **self-driving vehicle in one semester (15 weeks)**.
- **p. 13** As a result of the JMU X-Labs **Drones** class, the **Smithsonian Conservation Biology Institute (SCBI) hired biology student Kristen Grimshaw as the only paid undergraduate intern** to develop drone technology that monitors grassland bird nests using thermal imaging.
- **p. 18** In the first **Hacking for Diplomacy** class in the nation, JMU X-Labs students learned **invaluable skills for their careers** and provided meaningful solutions for cybersecurity and hate crime issues.

JMU VISION

TO BE THE NATIONAL MODEL FOR THE ENGAGED UNIVERSITY: ENGAGED WITH IDEAS AND THE WORLD.

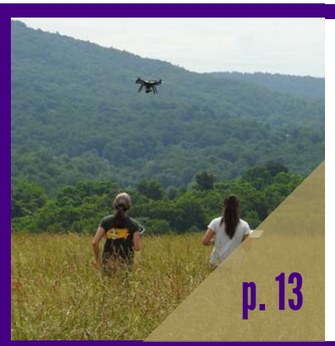
How we're fulfilling this vision...

- **p. 24** The JMU X-Labs model of education has caught the attention of three renowned companies who are now **sponsoring** the program: **BAE, TSSi,** and **Compass.**
- **p. 30** The **2018 Virginia Industry Resources Through Undergraduate Education Summit (VIRTUES)** attracted **industry professionals**, **legislators** and **faculty** from across the commonwealth.
- The **JMU X-Labs model of education** has attracted visitors from organizations around the country, including **Dell**, **Gartner** and **Stanford University.**
- **p. 42 JMU X-Labs** has received presentation invitations from notable organizations such as the **U.S. Congress** and the **Conference on Higher Education Advances**.

JMU JAMES MADISON UNIVERSITY

ALIGNING OBJECTIVES

JMU JAMES MADISON UNIVERSITY



BAE SYSTEMS INSPIRED WORK

TSSi

COMPASS

4-VA MISSION & OBJECTIVES

PROMOTE COLLABORATIONS THAT LEVERAGE THE STRENGTHS OF EACH PARTNER UNIVERSITY AND IMPROVE EFFICIENCIES IN HIGHER EDUCATION ACROSS THE COMMONWEALTH OF VIRGINIA.

How we're fulfilling this mission...

- p. 44 Because of 4-VA **shared courses**, **students have more access** to less commonly taught languages through other Virginia universities.

How we're meeting these objectives...

OBJECTIVE – SIGNIFICANTLY EXPAND ACCESS FOR ALL VIRGINIANS TO PROGRAMS, PREPARING THEM FOR REWARDING CAREERS

- **p. 45 4-VA at JMU worked with Capital One** to develop a non-credit cybersecurity certificate to help IT professionals transition to the cybersecurity profession and **meet the high demand** for qualified employees.

OBJECTIVE – DEFINE INSTRUCTIONAL MODELS, INCLUDING THE CLEAR DEFINITION OF INSTRUCTIONAL COSTS

- **p. 44 4-VA at JMU** funded a project to **boost student retention rates** in biology by developing an engaging, student-centered first-year experience.
- **p. 44** An intro chemistry course redesign **reduced drop, fail, and withdraw rates to zero**.

OBJECTIVE –INCREASE THE RESEARCH COMPETITIVENESS OF PARTNER UNIVERSITIES FOR EXTERNAL FUNDING

- **p. 37** Ashleigh Baber was **awarded $100,000** for a Research Corporation Cottrell Scholars Award.

4-VA Advancing The Commonwealth

ALIGNING OBJECTIVES

4-VA Advancing The Commonwealth

p. 44

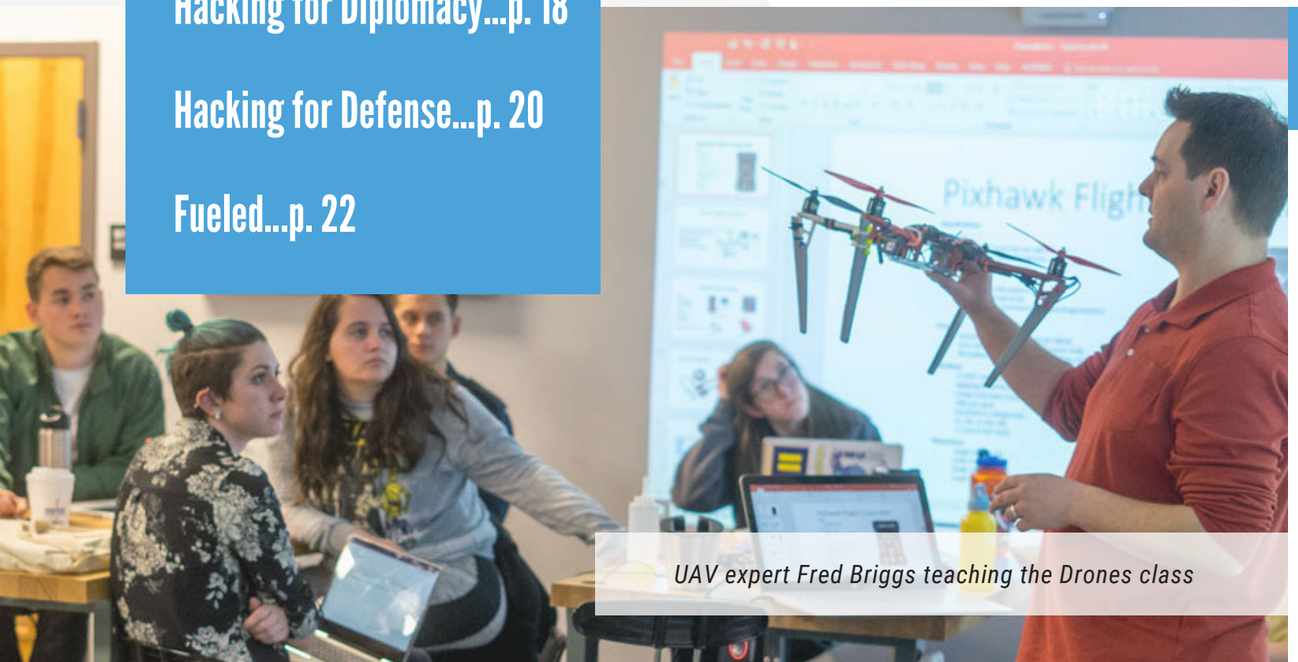
p. 45

p. 44

p. 37

JMU X-LABS CLASSES

At a time when higher education is trying to keep pace with the rapidly changing needs in industry, it is increasingly important to provide students with skills that go beyond traditional expectations. With its **multidisciplinary courses**, JMU X-Labs challenges students to investigate all aspects of a problem, **collaborate with industry professionals** and peers from different majors, iterate ideas and welcome meaningful failure to **solve real problems**. Courses are shared across departments and in collaboration with experts in various fields across the country.



UAV expert Fred Briggs teaching the Drones class

2017-2018

8 Courses

36 Majors

36 majors

Accounting
Biology
Biotechnology
Communication Studies
Computer Information Systems
Computer Science
Dietetics
Economics
Engineering
English Literature
Finance
Geographic Science
Graphic Design
Health Sciences
Hospitality Management
Independent Scholars
Individualized Study
Industrial Design
Integrated Science and Technology
Intelligence Analysis
Interdisciplinary Liberal Studies
International Affairs
Justice Studies
Management
Mathematics & Statistics
Media Arts & Design
Music
Nursing
Physics
Political Science
Psychology
Public Policy and Administration
Social Work
Sociology
Sport and Recreation Management
Writing, Rhetoric and Technical Communication

2017-2018 INDUSTRY PARTNERS

VIRGINIA DGIF

Smithsonian National Zoological Park Conservation Biology Institute

U.S. AIR FORCE

PEACETECH LAB

BLUE RIDGE PRISM PARTNERSHIP FOR REGIONAL INVASIVE SPECIES MANAGEMENT

DEPARTMENT OF STATE UNITED STATES OF AMERICA

PROTECT PROJECT SUSTAIN

U.S. DEPARTMENT OF HOMELAND SECURITY

UNITED STATES SPECIAL OPERATIONS COMMAND

NOVA Labs Rediscover the joy of making things

THE ASPEN INSTITUTE

Joel Spiers ('19) working on the virtual reality tour of campus for JMU Admissions using a Suitable Technologies Beam robot and an Insta360 Pro camera

AUGMENTED AND VIRTUAL REALITY

Faculty
James Barnes

In 2017, students from several different majors began designing and building a virtual reality (VR) tour of JMU's campus **using the latest technology in 360° media and VR**. Students from both the fall 2017 and the spring 2018 classes used videography, coding and user experience design to develop "Experience JMU 360: A Virtual Tour".

JMU JAMES MADISON UNIVERSITY

In partnership with the **JMU Office of Admissions** and **University Communications & Marketing**, the tour is now part of a recruitment exhibit in the newly renovated Madison Hall.

STUDENT MAJORS

- Biology
- Computer Information Systems
- Computer Science
- Graphic Design
- Industrial Design
- Integrated Science and Technology
- Media Arts & Design
- Mathematics & Statistics
- Communication Studies
- Public Policy and Administration

Undergraduate Class Founder
Skylar Wolen ('18)

STUDENT MAJORS

- Biology
- Computer Science
- Engineering
- Geographic Science
- Industrial Design
- Integrated Science and Technology
- Physics
- Psychology

INDUSTRY PARTNERS

Blue Ridge PRISM Partnership for Regional Invasive Species Management

Virginia DGIF

Smithsonian
National Zoological Park
Conservation Biology Institute

The spring 2018 Drones class was the **third** JMU X-Labs course to focus on unmanned systems technology and the most ambitious yet. Along with unmanned aerial vehicle experts from Nova Labs, **70 students** from **8 majors** and **2 universities** (JMU and ODU) partnered with the Smithsonian Conservation Biology Institute (SCBI), the Virginia Department of Game and Inland Fisheries (VDGIF) and Blue Ridge PRISM. The partners provided eight pressing ecological problems and delegated them to interdisciplinary student teams to give them real-world experience using unmanned systems technology:

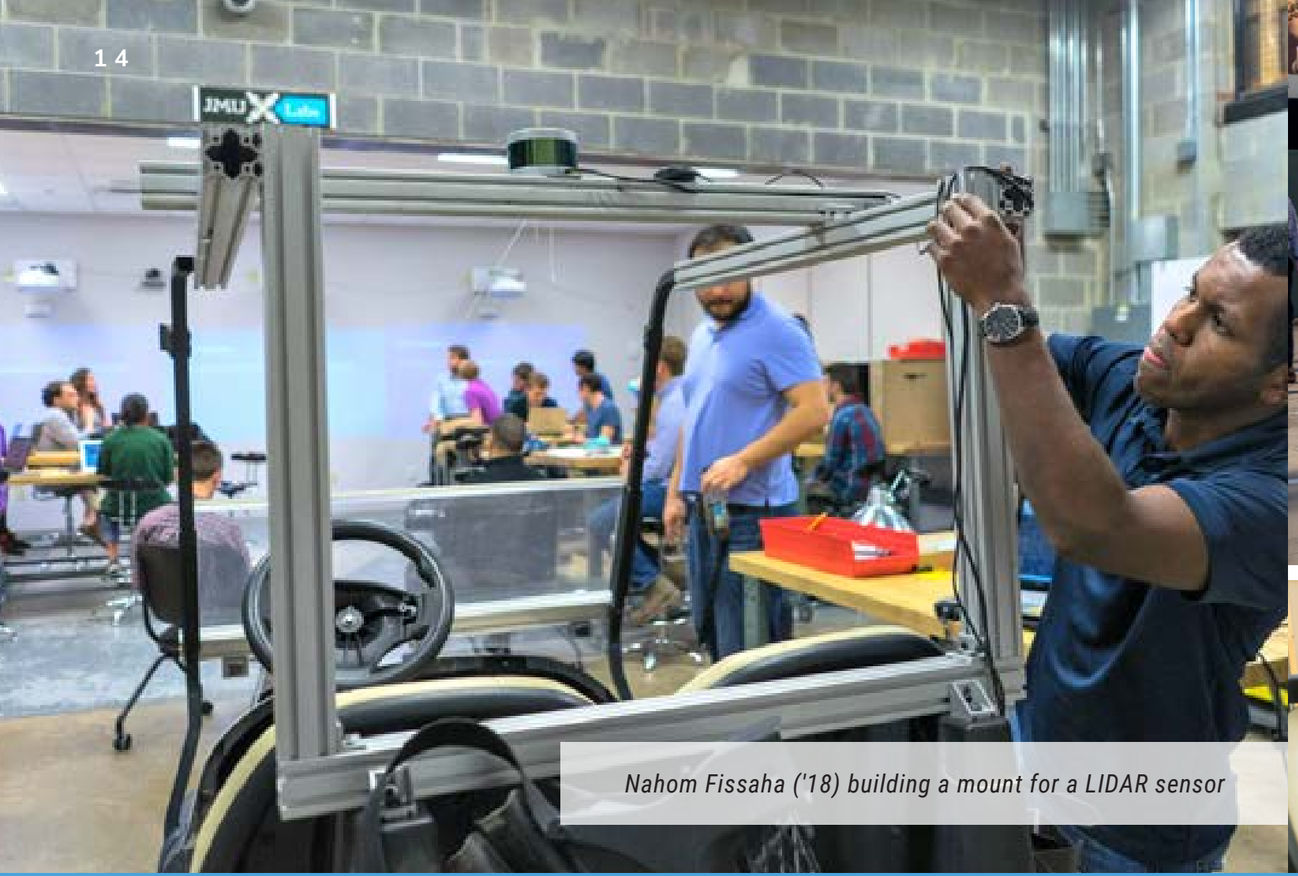
- Tracking deer and elk
- Surveying peregrine falcons
- Surveying for invasive terrestrial plants
- Digitizing oyster reefs in the Chesapeake Bay
- Collecting grassland bird data in Piedmont
- Collecting dung beetle data
- Tracking pregnant bears
- Safely darting with drones to help treat injured animals and to track and protect endangered species

DRONES

As a result of the Drones class, the **Smithsonian Conservation Biology Institute (SCBI) hired Kristen Grimshaw, a biology student from the class**, to pilot a JMU X-Labs innovator in residence program. With her experience as part of #TeamGrasslandBirds, Kristen—as t**he only paid undergraduate intern**—worked with graduate students and the SCBI team over the summer to develop drone technology that monitors grassland bird nests using thermal imaging. Kristen presented a poster on the project with her team at the 2018 Ecological Society of America Annual Meeting in New Orleans in August.

Faculty	Department/Company
Dr. Thomas Alberts	Mechanical & Aerospace Engineering at ODU
Audrey Barnes	Industrial Design
James Barnes	JMU X-Labs
Fred Briggs	Teq Strategy
Dr. Kevin Giovanetti	Physics and Astronomy
Dr. Patrice Ludwig	Biology
Dr. Seán McCarthy	Writing, Rhetoric and Technical Communication
Dr. Christopher Vo	Sentien Robotics

Kristen Grimshaw (left) and fellow SCBI intern Sarah Macey use a drone to survey grassland bird nests in Warren County.



Nahom Fissaha ('18) building a mount for a LIDAR sensor

AUTONOMOUS VEHICLES

September 2018

The Autonomous Vehicles class won a **Governor's Technology Award** for innovative use of technology in education.

Faculty	Department
Dr. Samy El-Tawab	Integrated Science and Technology
Dr. Nathan Sprague	Computer Science

With companies like Torc Robotics in Blacksburg and Perrone Robotics in Crozet, the autonomous vehicle job market in Virginia needs experienced and capable professionals who learn how to tackle complex problems before graduation.

In the spring of 2018, the pilot JMU X-Labs autonomous vehicles course offered undergraduate students the opportunity to work in multidisciplinary teams to bring the autonomous concept out of simulation and into the real world. With hands-on experience, at the intersection of design, engineering, systems, software, controls, and project management, students designed and implemented a variety of systems and sensors that **transformed a golf cart into a self-driving vehicle in one semester (15 weeks)**—all without any prior experience or professional guidance.

Professor of Physics and Astronomy Dr. Gabriel Niculescu is teaching a continuation of the class in the fall of 2018 to tackle the wide range of technical challenges that come with incorporating human and other real-life interactions into the design.

Undergraduate Class Founder
Richard Xu ('18)

STUDENT MAJORS

- Communication Studies
- Computer Science
- Engineering
- Independent Scholars
- Integrated Science and Technology

STUDENT MAJORS

- Biology
- Biotechnology
- Engineering
- Health Sciences
- Industrial Design
- Individualized Study
- Nursing
- Public Policy and Administration

In the fall of 2017—in its third iteration—the Medical Innovations class at JMU X-Labs taught students to design practical, ethical solutions to address the **opioid crisis**. Students worked in transdisciplinary teams using innovative technology to develop products that offered solutions, such as an alternative option for pain relief, and a secure, timed, medicine dispensary unit for patients suffering from addiction.

Medical Innovations will expand in the fall of 2018 with the addition of students and faculty from kinesiology. It will be the second consecutive year multidisciplinary student teams will focus on aspects of the opioid crisis.

Faculty	Department
Dr. Erica Lewis	Nursing
Dr. Patrice Ludwig	Biology
Dr. Jacquelyn Nagel	Engineering

MEDICAL INNOVATIONS

STUDENT MAJORS

- Accounting
- Computer Information Systems
- Computer Science
- Engineering
- Finance
- Integrated Science and Technology
- Management
- Political Science
- Public Policy and Administration

Undergraduate Class Founder
Skylar Wolen (‘18)

By student request, JMU X-Labs offered its first Blockchain class in the spring of 2018. The demand for experts in blockchain technology is growing worldwide, as businesses apply it to a variety of transaction platforms such as contracting, logistics, supply chain, healthcare, public documents, real estate, and cybersecurity. Students who can fulfill this demand on the front end of the cycle will provide real value as industries and enterprises discover more applications for the technology.

The 2018 pilot class began **writing a textbook** on blockchain, a first of its kind. Each one of the 30+ students in the class researched and wrote at least one section of the book, whose working title is Blockchain: Technology, Application & Societal Implications. The book is designed to be an **open educational resource** that serves as a comprehensive introduction to the fundamentals of the technology.

Faculty	Department
Dr. Morgan Benton	Integrated Science and Technology
Dr. Nicole Radziwill	Integrated Science and Technology

BLOCKCHAIN

INDUSTRY PARTNERS

PEACETECH LAB

UNITED STATES SPECIAL OPERATIONS COMMAND

THE ASPEN INSTITUTE

ENDGAME.

Kirsten San Nicolas ('18) working with her cross-disciplinary team on a cybersecurity solution for their client, a company called Endgame

HACKING FOR DIPLOMACY

Faculty	Department
Dr. Bernie Kaussler	Political Science
Dr. Seán McCarthy	Writing, Rhetoric and Technical Communication
Dr. Kurt Paterson	Engineering
Dr. Jennifer PeeksMease	Communication Studies
Nick Swayne	JMU X-Labs

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

Designed by Stanford University, Hacking for Diplomacy (H4Di) uses innovative research methods for multidisciplinary student teams to tackle real-world problems that resist easy resolution.

In 2017, **JMU offered the only H4Di course in the country at JMU X-Labs and was the first in the nation to offer it exclusively to undergraduate students.** Unlike other "Hacking for" courses (Hacking for Defense™, H4Di, etc.), JMU X-Labs staff and faculty did the legwork themselves to secure industry partners with intractable problems for the class to tackle. As a result, students from **9 different majors** worked in multidisciplinary teams on problems as diverse as **cybersecurity** and **hate crime prevention** for clients such as the **U.S. Special Operations Command (USSOCOM)**, a nonpartisan think tank called **The Aspen Institute**, a cybersecurity firm called **Endgame** and a nonprofit called **PeaceTech Lab**.

STUDENT MAJORS

- Economics
- Engineering
- English Literature
- Intelligence Analysis
- International Affairs
- Communication Studies
- Public Policy and Administration
- Sociology
- Writing, Rhetoric and Technical Communication

STUDENT MAJORS

- Computer Information Systems
- Economics
- Engineering
- Geographic Science
- Health Sciences
- Integrated Science and Technology
- Intelligence Analysis
- International Affairs
- Mathematics & Statistics
- Political Science
- Public Policy and Administration
- Writing, Rhetoric and Technical Communication

INDUSTRY PARNTERS

U.S. AIR FORCE

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

Hacking for Defense™ (H4D) is an education initiative that applies design thinking and the Lean Startup model to solve real and complex problems in the defense and intelligence communities. To do this, multidisciplinary student teams interview dozens of clients and experts every week and constantly prototype solutions.

Developed by Stanford University, 20 universities across the U.S. are now using the H4D program, including Georgia Tech and Georgetown University. **JMU is the first institution to exclusively offer the class to undergraduate students.**

HACKING FOR DEFENSE

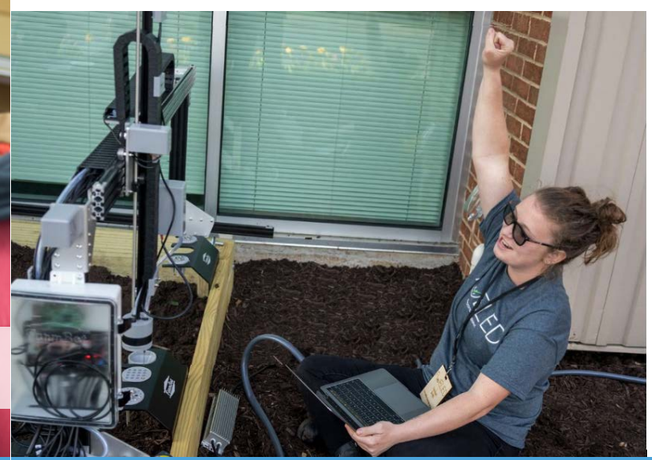
Undergraduate Class Founder
Jack O'Neill ('17)

In the spring of 2018, JMU X-Labs hosted its second H4D class where **25 students** from **12 different majors** pursued the following solutions based on the needs of client partners from the **U.S. Air Force**, the **U.S. Army**, the **U.S. Department of Homeland Security**, and the **U.S. Department of State**:

1. Develop a faster way to log flight records
2. Track recalled medical devices
3. Track passengers and carry-on bags for safer and faster airport security screening
4. Prevent human trafficking

Faculty	Department
Dr. John Guo	Computing Information Systems
Dr. Steve Harper	Engineering
Dr. Keith Holland	Engineering
Dr. Bernie Kaussler	Political Science
Dr. Erica Lewis	Nursing
Dr. Seán McCarthy	Writing, Rhetoric and Technical Communication

Students from the Fueled class presenting their projects beside the food truck



FUELED

Faculty	Department
Dr. Larissa Mark	Integrated Science and Technology
Dr. Mikaela Schmitt-Harsh	Biology

Fueled is a collaborative, **student-run** food truck initiative designed to promote **health**, **sustainability**, and **holistic living** through **outreach activities**, bring **locally-sourced foods** to JMU, and **stimulate businesses** in the surrounding community. Multidisciplinary student teams work together on innovative projects that are **directly applicable to the business needs** of the Fueled food truck. Fueled is partnered with **Aramark,** the organization behind JMU Dining Services, which facilitates Fueled and other food trucks across campus.

Creative development and implementation of team concepts focus on industrial and environmental design, nutrition/health promotion, mind-body awareness, graphic design, marketing, campus/K-12 education and community engagement. The course's structure provides a framework that can be shared nationally with other universities.

STUDENT MAJORS

- Biology
- Communication Studies
- Dietetics
- Geographic Science
- Health Sciences
- Hospitality Management
- Interdisciplinary Liberal Studies
- Integrated Science and Technology
- Justice Studies
- Management
- Music
- Psychology
- Social Work
- Sport and Recreation Management

Undergraduate Class Founder
Amanda Presgraves (‘16)

Student Leader
Hannah Smith (‘18)

JMU X-LABS SPONSORS

4-VA
Advancing The Commonwealth

Since 2010, **4-VA** has been implementing programs to support its 4 initiatives, including course sharing across disciplines, between academia and industry, and between universities and other institutions. JMU X-Labs was inspired and founded by 4-VA staff and 4-VA continues to be its primary sponsor.

BAE SYSTEMS
INSPIRED WORK

In late 2017, after hearing about the JMU X-Labs Drones class, **BAE Systems**—a large defense contractor with several offices in Virginia—showed interest in supporting the class. **But after learning about the JMU X-Labs model of education and its other classes, they awarded the entire program with a sponsorship grant of $7,500**.

TSSi

In early 2018, **TSSi** gifted JMU X-Labs with satellite equipment valued at more than **$33,000** under the stewardship of TSSi President and CEO **Bill Strang**.

COMPASS

In May of 2018, **Compass Cofounder Will Watson** offered to contribute customized tools and analysis to meet the needs of JMU X-Labs classes. Compass is the app that visualizes Slack data and Slack is the team collaboration tool that JMU X-Labs classes use to communicate and document their research.

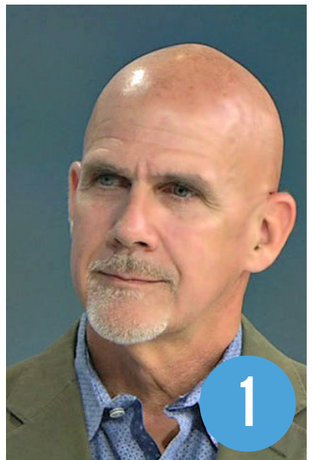
& PARTNERS

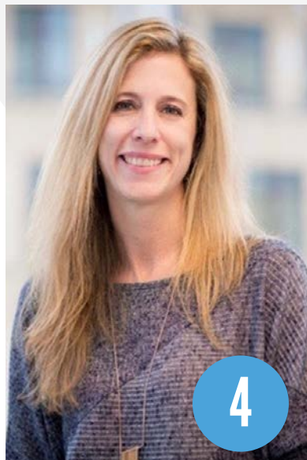
1 “Through Hacking for Defense, JMU continues to push the envelope to deliver cutting-edge learning to their students.”
– Peter Newell, Managing Partner at BMNT and Cofounder of Hacking for Defense Inc.

2 “[I saw them] rapidly becoming professionals. From our first interview you could tell they were uncomfortable and struggling a little bit to learn about the problem. By the end it was as if they were junior executives presenting an actual product that could actually be used in a real life application.”
– Industry partner from United States Special Operations Command

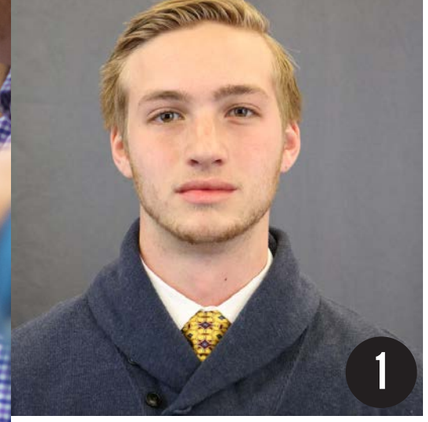
3 “The project introduced the problem of widespread financial insecurity to a new generation of problem-solvers, which I think will pay dividends for years to come.
Our field desperately needs new, outside-the-box ideas for solving the many financial problems ailing Americans—like income volatility, consumer debt, and lack of retirement savings. The more smart, young people we have thinking about these wicked problems, the better.”
– David Mitchell, Senior Program Manager, Aspen Institute Financial Security Program

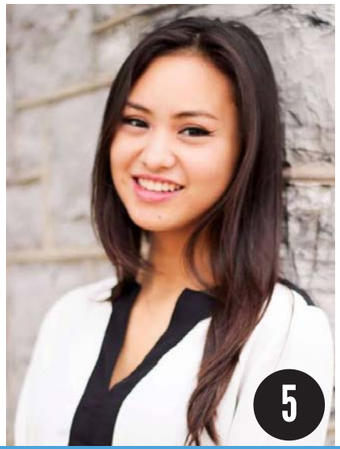
4 “They did a really nice job and have come a very long way over the course of the semester. They were well-prepared and extremely articulate about the problem set, their teamwork, and how they arrived at their solution. It is a tough task given the technical nature, but they embraced the challenge and I believe learned a lot in the process.”
– Andrea Little Limbago, Chief Social Scientist, Endgame





Associate Professor Samy El-Tawab working with Greg Mayo ('18) and other students to replace the original steering mechanisms with their own custom automated design





FACULTY & STUDENT IMPACT

1 “It’s easy to work with people in your major because you all have the same mindset. In this class we had to come together with our different mindsets and different approaches to find a middle ground and an understanding toward a meaningful solution.”
– Luke Robb (’19), Public Policy & Administration and Communication Studies

2 "The students get caught up in the problem and they think they’re stuck. But they’re actually at a tipping point of realizing their full potential. Our job is to push them past that tipping point so they recognize they’re capable of much more than they had imagined.”
– Jennifer PeeksMease, Assistant Professor of Communication Studies

3 “Without the Hacking for Defense class, I wouldn't have had half the opportunities that I do. Companies (IBM, Accenture, Deloitte, Booz Allen Hamilton) are amazed when I tell them I've done iterative/scrum-type work for a government client already.”
– Cassandra Hagstoz (‘18), Computer Information Systems

4 “When I was hired in 2018 to work at Microsoft, I could see how JMU X-Labs classes helped me learn how to pivot and adjust to brand new situations that are outside of my comfort zone. Going from the design and engineering projects I worked on at JMU X-Labs, I’ve been able to navigate a completely unfamiliar area (cloud computing) with more confidence. My JMU X-Labs experiences are part of the reason Microsoft hired me.”
– Nahom Fissaha (‘18), Engineering

5 “There’s a level of legwork and collaboration here that they don’t teach you in other classes that makes me feel more prepared for a career. This class really tests your ability and helps you learn how to apply your skills. Everyone this semester has brought something from their major to make this project work.”
– Kirsten San Nicolas (‘18), International Affairs and Economics

6 “People should take these classes because it gives you an opportunity to work with people from different majors on problems that matter.” – Cameron Robinson (‘19), Engineering

7 “Not only are they developing a solution, they’re also talking to all sorts of people in one area, building a network of professors and business experts, which opens doors for them and their clients that they didn’t even know existed. And by looking at these virtually unresolvable problems with fresh eyes, at the very least they’re going to provide a paradigm shift of how these companies are looking at a problem.”
– SeánMcCarthy, Associate Professor of Writing, Rhetoric and Technical Communication

JMU X-LABS EVENTS

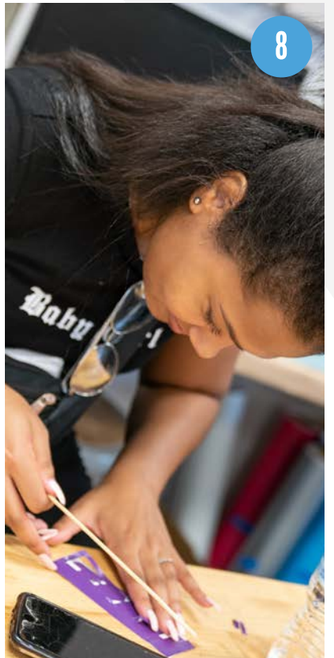
Behind the scenes, JMU X-Labs coordinated **over 50 events** this year with a staff of **only 4 full-time employees**, making it a priority to engage with local and global groups through the following:

1. Hosting workshops for elementary, middle, and high school students
2. Traveling offsite to inspire K-12 students at local STEM day events
3. Hosting conferences, such as the Virginia Industry Resources Through Undergraduate Education Summit (VIRTUES)
4. Hosting a biannual Innovation Summit to showcase student work each semester

REACHING MORE STUDENTS

When the numbers and demographics of JMU X-Labs participants didn't accurately represent the student population at JMU, the team made adjustments that resulted in **more balanced demographics** and **huge increases in participating students**.

5. Teaching Pop-Up classes – **Free**, not-for-credit classes for students, faculty, and community members
   The number of participants **nearly doubled** from fall to spring when an extra pop-up was added each week:
   - Fall 2017 – 20-60 students per week
   - Spring 2018 – **30-90 students per week**
6. Fab Lab – **250+ female students** experienced JMU X-Labs for the first time at the inaugural (and now annual) January 2018 event
7. 1787 freshman orientation event – **300-400 students** attended JMU X-Labs during their first week on campus
8. CHOICES – JMU X-Labs is part of this program for prospective, admitted students. After the 2018 event, several students told us **they decided to attend JMU, in part, because of hearing about JMU X-Labs at CHOICES**.
9. Bluestone Hacks – 24-hour hackathon with faculty and industry judges; Organized by students; **80+ student participants**



JMU Board of Visitor member and BRMi CEO Mike Battle (right) brainstorms with ComSonics Chief of New Technology Dick Shimp (middle) and Associate Professor of Computer Science Nathan Sprague (far left).

VIRTUES

2018 VIRGINIA INDUSTRY RESOURCES THROUGH UNDERGRADUATE EDUCATION SUMMIT (VIRTUES)

BRIDGING THE GAP BETWEEN CURRICULUM AND INDUSTRY

Held in March 2018, the **third** VIRTUES summit attracted industry professionals from across the country and featured the JMU X-Labs model of education, which provides **strategic coordination between higher education and industry** to foster creative, confident, and market-ready students who are experienced in emerging technologies.

In its **third year** of collaborating with **distinguished government and industry organizations**, JMU X-Labs welcomed new industry professionals to plug into its expanding programs and work directly with students and faculty from universities across Virginia.

After opening remarks from **JMU President Alger** and **Provost Coltman**, the summit offered 3 interactive sessions to develop these partnerships:

1) Transform courses into partnerships
2) Discover partnership benefits
3) Ideate and collaborate

The JMU X-Labs Innovation Summit featured over **180 students** from **6 courses** and **35 different majors** who displayed and presented their final projects to administrators, industry client partners, family and friends. Members of the greater community connected with extraordinary students, watched key presentations and explored an open symposium of demonstrations and displays of student solutions to real problems from client partners.

SPRING 2018 CLASSES AND DISPLAYS

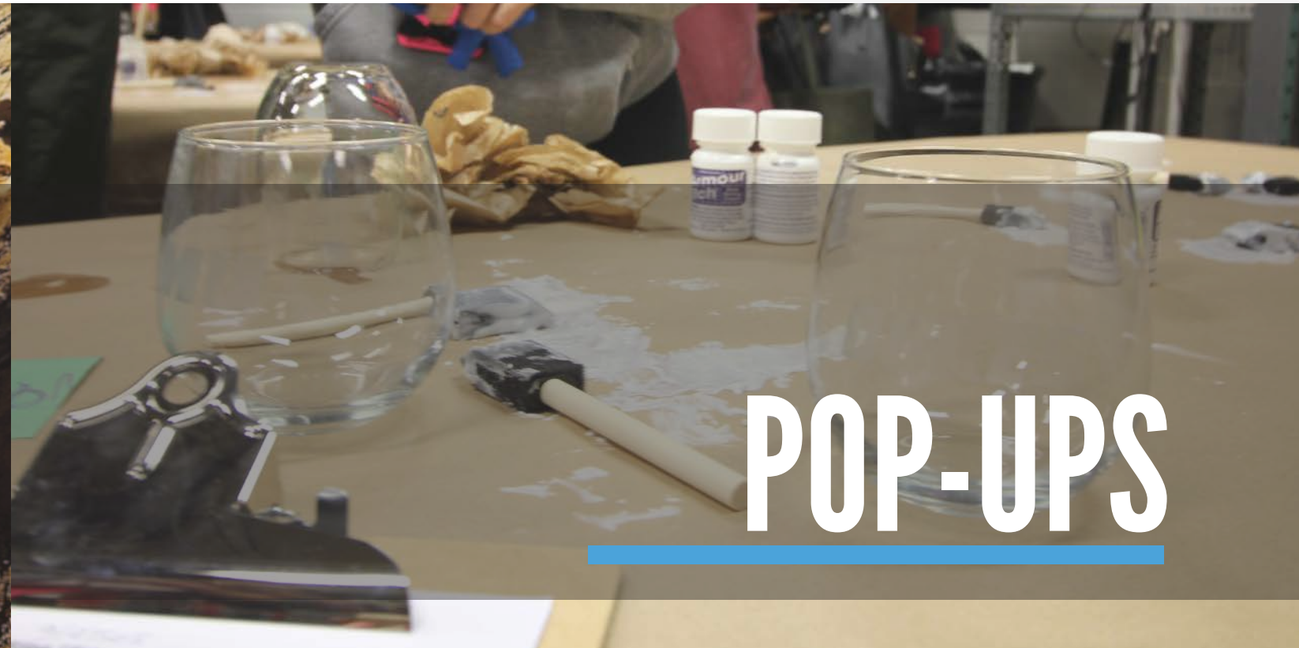
- Augmented/Virtual Reality
- Autonomous Vehicles
- Blockchain
- Drones
- Fueled food truck
- Hacking for Defense™
- Robotics Minor capstone event

INNOVATION SUMMIT

Pop-Ups are free, non-credit classes for students, faculty, and community members. **Taught 2 times a week** in 2017-2018 by JMU X-Labs staff, JMU 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 offer low-barrier access to all students as a way to introduce them to the lab and get their creative ideas flowing.

2017-2018 POP-UP TOPICS INCLUDED THE FOLLOWING:

- Quad brick engraving
- Glass etching
- DIY planters
- Drone quidditch
- Laptop stickers
- Liquid nitrogen ice cream
- DIY music electronics
- Wild edibles
- Spa essentials



POP-UPS

Over 250 women from the JMU community attended the first annual Fab Lab event to design, create and collaborate together.

FAB LAB

On January 29th, over **250 students** flocked to Fab Lab, the first annual event for women at JMU X-Labs. With **over 40 additional students** on the waitlist, it was clear that designing, creating, and collaborating had a strong appeal for women across campus.

Entrepreneur and JMU alumna Amanda Presgraves (‘16) kicked off the event by welcoming the students and sharing her journey of starting the Fueled food truck and founding the subsequent JMU X-Labs Fueled class.

Hannah Smith (’18) further discussed the available resources that allowed her to follow her passion for sustainability and nutrition through the Fueled class.

Students then had the opportunity to explore JMU X-Labs and its various technologies, equipment, and activities throughout the building:

- Making liquid nitrogen ice cream
- Designing buttons
- Cooking crêpes
- Making slime
- Etching wine glasses
- Experimenting with virtual reality
- Flying drones through quidditch hoops
- Laser cutting latte stencils

“This event is geared towards showing the women of JMU that JMU X-Labs is a space for everyone no matter your major or gender, and that any idea you have can be brought to life here.” – JMU X-Labs Student Intern Emma deLeon, as reported by The Daily Duke

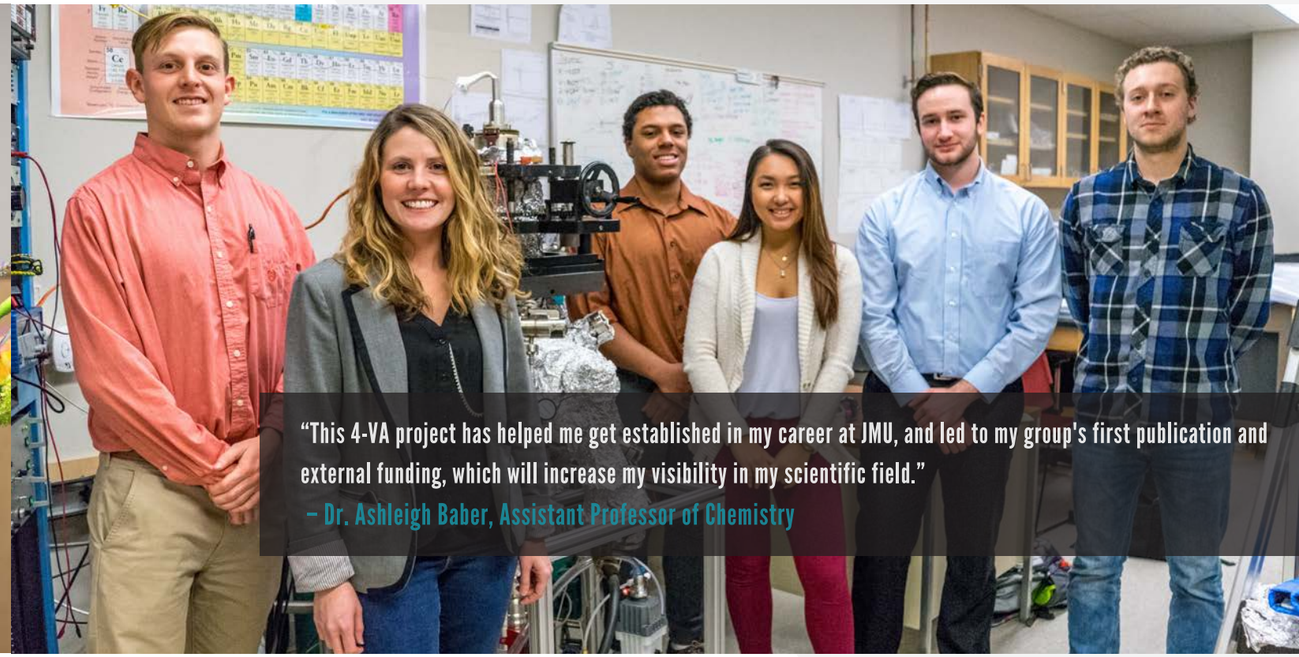
2017-2018 4-VA RESEARCH GRANTS

USING DEBATE TO IMPROVE STUDENT LEARNING

"We have students who self-reported improving their collaboration skills, critical thinking, research ability, application of classroom material, etc., based on the integration of debate activities into the classes." – Dr. Paul Mabrey, Communication Center Coordinator

ELEMENTARY WRITING METHODS COURSES

"Our results indicate that teacher educators value and use modeling and approximations of practice more often than other high leverage practices in their writing methods courses. This is important, because "Having opportunities to rehearse. . .in environments that are less complex than classrooms, can help novices hone their practice and prepare them for when they will need to respond in the moment" (Grossman et al., 2009, p. 279)." – **Dr. Joy Meyers, Assistant Professor of Education**



"This 4-VA project has helped me get established in my career at JMU, and led to my group's first publication and external funding, which will increase my visibility in my scientific field."
– Dr. Ashleigh Baber, Assistant Professor of Chemistry

Dr. Ashleigh Baber received a **$100,000 Research Corporation Cottrell Scholars Award** for her 4-VA-funded work "to examine how modifying the surfaces of Titania/Gold (TiO2/Au) catalysts influences chemical reactions." (rescorp.org/cottrell-scholars/cs-awardees-2018)

$152,000+
Awarded

25
Proposals funded

5
Course redesign projects

3
International projects

14
First time grant award recipients

6
New departments

SINCE 4-VA BEGAN IN 2011

95+
Total grant recipients

8
All colleges represented

30+
Departments

THE STUDY OF WATER IN INTERNATIONAL CONTEXTS

"...[W]e designed and successfully implemented a STEAM (science, technology, arts, and mathematics) approach to a vital resource—water—as part of a study abroad experience, [which] included a community engagement initiative with a government organization and local community in Ireland, as well as a research project."
– Dr. Seán McCarthy, Assistant Professor of Writing, Rhetoric and Technical Communication

EXPANDING THE JMU CENTER FOR GENOME AND METAGENOME STUDIES

"Our [project] led to further collaborations with the FDA, the USDA, and the state public health lab (DCLS), and as a result we launched an entirely new research project on Salmonella genomic epidemiology. Also, my former student on this project, Kevin Libuit,...landed a job as a bioinformatician at the Virginia DCLS...as a result of my collaboration with Dr. Stephen Turner at UVA." **– Dr. James Herrick, Associate Professor of Biology**

THE ORIGINS OF SUPERMASSIVE BLACK HOLES

"I feel that these 4-VA funds provide unique opportunities to grow for our undergraduates, and also that they show the world that there is value in pure science, that the next generation can be inspired by the big questions, because that is fundamental to being human."
– Dr. Anca Constantin, Associate Professor of Physics and Astronomy

SUMMER STATS REFRESHER BOOT CAMP

"Students' statistics knowledge and confidence (efficacy) in statistics increased as a result of the boot camp."
– Dr. Jeanne Horst, Associate Professor at the Center for Assessment & Research Studies

GROUNDBREAKING INTRO STATISTIC AND DATA SCIENCE CURRICULUM

"Curriculum has now been used in 20 universities around the world. This semester about 250 students in Australia are using it."
– Dr. Nicole Radziwill, Associate Professor of Integrated Science and Technology

STREAM ACIDIFICATION AND FISH SPECIES DIVERSITY

"Our research found substantial and lasting impacts of acid rain on stream fish diversity in Shenandoah National Park."
– Dr. Christine May, Associate Professor of Biology

RESEARCH IMPACT

AUTISM AND GENOME EDITING

"We recently discovered that a gene mutation associated with autism negatively affects the way developing brain cells in the cerebral cortex wire up with other neurons. We are working to discover more about the way this gene works in brain cells so that we can find a way to counteract the debilitating effect of this gene mutation."
– Dr. George Vidal, Assistant Professor of Biology

ICE HOUSE FURNITURE PROJECT

"The original ICE House furniture project introduced me to a host of other interesting faculty who, like me, want to do more interdisciplinary work both in their research and teaching. I am very thankful for the opportunities and connections I have made through the process."
– Dr. Audrey Barnes, Assistant Professor of Industrial Design

MADISON ACCELERATOR LABORATORY WORKSHOP

"The workshop organized last summer with 4-VA funds helped to foster new collaborations both at JMU and with other academic institutions in Virginia...we achieved the goals of last summer's workshop beyond our initial expectations."
– Dr. Adriana Banu, Associate Professor of Physics

FABRICATING MINIATURIZED LASERS

"We established a research collaboration with Professor Chennupati Jagadish who is a well-known distinguished professor of Physics at the Australian National University, Research School of Physics and Engineering. His contribution can boost our research, leading to high quality publications and higher chances of getting external funding which helps our group and JMU get more recognition."
– Dr. Masoud Kaveh Baghbadorani, Assistant Professor of Physics

REAL-TIME DATA COLLECTION FOR CLASSROOMS

"We continue to use the growth mindset app that we created with 4-VA funding in our local middle schools, and have worked with teachers/administrators to develop a series of additional and unique growth mindset interventions and learning experiences for each year of middle school."
– Dr. Kenn Barron, Professor of Psychology

COURSE REDESIGN FOR SOCIAL IMPACT CLASS

"As a prototype of the interdisciplinary practice envisioned for the Friendly City Design Studio course, students engage with local businesses, farmers, JMU students, and the community at large to understand our connection with the landscape of food in our community. This process has yielded connections to faculty involved with the Blue Ridge Area Food Bank."
– Carissa Henriques, Assistant Professor of Graphic Design

4-VA

JMU President Jonathan Alger talking with Associate Professor James Herrick and Provost Heather Coltman at the 2017 Annual Symposium

ANNUAL SYMPOSIUM

Every year, 4-VA hosts a symposium to showcase the work of its grant recipients and faculty. Teams are invited to display a poster of their work and this year on September 20, 2017, **speakers from 6 different grants** spoke briefly about their projects.

JMU **President Alger** opened with the welcome address and **Provost Heather Coltman** introduced each speaker. It was the biggest turnout yet with **more than 60 attendees** including deans, department heads, faculty and students.

SPEAKERS

- **Amanda Presgraves** talked about her inspiration for starting the **Fueled** food truck and how it evolved into a **platform for education**.
- **Dr. Anca Constantin** discussed her work with **Dr. Shobita Satyapal at GMU** on the 4-VA grant **The Search for the Origins of Supermassive Black Holes**.
- **Dr. Christine May** talked about her work with **Dr. Todd Scanlon** and **Ami Riscassi** from **UVA** on a 4-VA project about **stream acidification and fish species richness.**
- **Dr. Daniel Downey** talked about his collaboration with the **Virginia Department of Game and Inland Fisheries** on a 4-VA project called **Water Quality Improvement Pilot Study for Montebello Fish Culture Station**.
- **Hannah Smith** shared how the **Fueled** class **impacted her college career**.
- **Dr. James Herrick** discussed how his team unexpectedly **discovered that some plasmids are resistant to antibiotics that are reserved only for extremely drug-resistant infections**.
- **Dr. Karim Altaii** presented the results of his case study with **Dr. Olga Pierrakos** on **flipping Energy Fundamentals (ISAT 310)**, a thermodynamics class.

4-VA

JMU X-LABS IMPACT

3 Government reports

11 TV/Video features

36 Print features

1. In January of 2018, George Mason University partnered with JMU X-Labs to host the Small Business Development Center (SBDC) Network's **Innovation Commercialization Assistance Program** (ICAP), which "helps inventors and entrepreneurs take the right first steps in bringing new technologies and innovations to market." **Several JMU X-Labs student entrepreneurs were selected to participate in the training.**

2. On February 9, 2018, several JMU X-Labs students (**Christian Caruso** ('19), **Nahom Fissaha** ('18), **Sally Todd** ('18), **Claire Fulk** ('17) and **Skylar Wolen** ('18)) **presented to the JMU Board of Visitors** about the impact of JMU X-Labs on their education **at the request of President Alger**.

3. On March 15, 2018, Hacking for Defense students **Nahom Fissaha** ('18) and **Emma Richer** ('17) **presented to members of Congress** on Capitol Hill about the class, alongside students from Georgetown University, Columbia University, and The Defense Acquisition University.

4. In April of 2018, JMU X-Labs was acknowledged in an article published by **The New York Times**, in addition to **45+** other **news features**.

5. In April of 2018, #TeamOyster **students** from the Drones class **traveled to Centipede Bay, Florida to test their underwater drone** in collaboration with Dr. Josh Patterson from the University of Florida.

6. In September of 2018, **JMU X-Labs was awarded its second consecutive Governor's Technology Award** for innovative use of technology in education, this time for the Autonomous Vehicles class.

7 Publications

30% Higher earning potential for students

$43,267 External funding

15 Conferences

2017-2018 STUDENT VENTURES

- **Youkulele** is a ukulele building company/workshop for music education founded by **Jon Stapleton ('16)**.
- **Collegiate Customs** is a custom apparel company founded by **Chris Ashley ('17)** and **Sina Shahcheraghi ('19)**. collegiatecustoms.com
- **BarTrack** is a company that manufactures automated beer pourers, founded by **Sally Todd ('18)** and others.
- Founded by **Nahom Fissaha ('18)** and **Jacob Ziemke ('18)**, **MediValley** developed a device that suppresses the chronic cough.

4-VA IMPACT

1. An introductory chemistry course redesign and intervention program **reduced drop, fail, and withdraw (DFW) rates to zero**. The pilot project is now being expanded and adopted by the College of Science and Mathematics for biology, chemistry and physics.

2. 4-VA at JMU funded a project to **boost student retention rates** in biology by developing an engaging, student-centered first-year experience.

SHARED COURSES

JMU HOSTED

- Portuguese 102. Elementary Portuguese
- Portuguese 231. Intermediate Portuguese
- Graduate Studies 550E. Data Management Skills
- Political Science 398. Simulations
- Justice Studies 301. Special Topics in Justice Studies

JMU RECIEVED

- Korean 101. Elementary Korean I
- Persian 111. Intensive Persian I
- Persian 232. Intermediate Persian II
- Korean 102. Elementary Korean II
- Persian 231. Intermediate Persian I
- Persian 490. Special Studies in Persian

3. The annual **jmUDESIGN** workshop had **33 participants from 4 institutions**, including two community colleges.

4. The **Department of Chemistry** has started a redesign of their core courses, starting with their lab experiences, implementing the lessons from the biology project and the Vision & Change in Undergraduate Biology Education initiative. Over the summer they developed **10+ new hands-on, open-ended lab experiments**.

5. 4-VA at JMU worked with an industry partner from **Capital One** to develop a non-credit cybersecurity certificate to help IT professionals transition to the cybersecurity profession, where **demand far exceeds the supply** of qualified employees. **JMU Outreach and Engagement** conducted a statewide market analysis and needs assessment and subsequently developed the first of a planned 5-course module in cybersecurity. That module is currently being field-tested at a regional higher education center.

"Sharing courses has positively impacted the Department of Foreign Languages at JMU. Because of 4-VA, less commonly taught languages can be taught up to the intermediate level (two years), which allows students to fulfill the requirements for a B.A."
– Dr. Giuliana Fazzion, Head of the Department of Foreign Languages, Literatures and Cultures

4-VA

COMING 2018-2019

FALL 2018 CLASSES

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

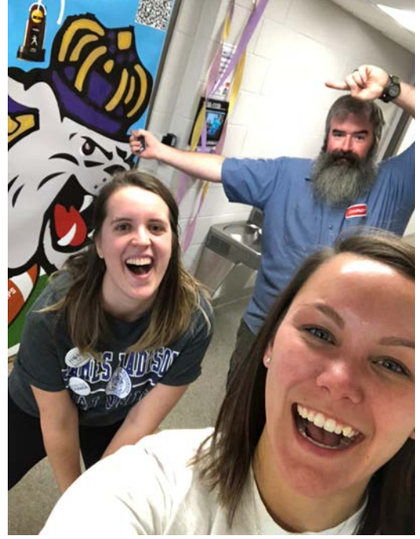
SPRING 2019 CLASSES

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

THANK YOU

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

- Jonathan Alger
- Matt Banfield
- James Barnes
- Peter Blake
- Troy Bolton
- Andy Casiello
- Dean Claud
- Heather Coltman
- Nancy Dauer
- Ben Delp
- Deborah Derden
- Will Fox
- Elizabeth Gillooly
- Marcy Glover
- Yvonne Harris
- Tamara Hatch
- Archie Holmes
- Dale Hulvey
- Josh Humphries
- Dick Johnson
- Krystian Jones
- Wendy Kang
- Janette Kenner Muir
- Charlie King
- Bob Kolvoord
- David Lamm
- Erica Lewis
- Patrice Ludwig
- Seán McCarthy
- Cara Meixner
- Christa Miller
- Adam Murray
- Deborah Noble-Triplett
- Dale Pike
- Atif Qarni
- John Ryan
- James Shaeffer
- Nicky Swayne
- Quinn Warnick



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Photography by Elise Trissel, Mike Miriello and University Communications and Marketing

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