



4-VA

Advancing The Commonwealth

2016-2017 Annual Report

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Letter from the Director

A Year of Transition

As 4-VA closes out its sixth year of operations we note continued progress in advancing our mission to promote collaborations that leverage the strengths of each partner university and improve the efficiencies in higher education across the Commonwealth of Virginia. The initiatives requiring the greatest level of collaboration – Collaborative Research and Course Sharing – continue to mature and improve. The number of collaborative research projects involving three or more institutions grows each year along with a commensurate number of faculty working together across our institutions to seek large, externally funded research programs being derived from those partnerships.

During the 2016-17 academic year, we were formally joined by Virginia Commonwealth University thanks to the diligent work of Dr. John Ryan who will serve as VCU's campus coordinator. With six prominent institutions working together now, the opportunities for collaboration are even greater. As both ODU and VCU seek specific 4-VA funding, they are providing exceptional contributions in-kind and working with the other institutions to promote research collaborations and course sharing opportunities.

As a collaborative, we faced a number of leadership changes during the 2016-17 academic year. Several members of our team of campus coordinators and staff transitioned to other roles and we introduced 4-VA to new presidents and provosts. Among the more notable departures was Kelsey Kirland, our long-serving director of assessment. While transitions present challenges, they also provide an opportunity to reflect on what we are doing and refocus our energy to have even greater collective impact.

We look forward to what develops in the coming year!

Nick Swayne
Executive Director, 4-VA



Executive Summary

Collaborative Research

Grants Totaling \$551,550

JMU: 22 Awards

VT: 9 Awards

GMU: 5 Awards

UVA: 13 Awards

Course Redesign

Grants Totaling \$122,075

JMU: 1 Award

GMU: 11 Awards

Course Sharing

Grants Totaling \$278,150

JMU: 13 Awards

GMU: 4 Awards

Degree Completion

Grants Totaling \$42,335

GMU: 1 Award

JMU: 1 Award

Mission

4-VA Promotes Innovation and Advances the Commonwealth

4-VA is a collaborative partnership among six Virginia universities advancing four initiatives. 4-VA's mission is to promote collaborations that leverage the strengths of each partner university and improve efficiencies in higher education across the Commonwealth of Virginia.

4-VA carries out this mission by advocating partnerships between faculty and departments generating significant, innovative solutions to educational and real-world problems. Since 4-VA's inception, the collaborative has sponsored advancements in research, teaching and learning paradigms, online programs, industry-focused adult degrees, new technologies, interventions, workshops, conferences and many other programs.

4-VA History

In 2010, the presidents of George Mason University (GMU), James Madison University (JMU), the University of Virginia (UVA) and Virginia Tech (VT) combined forces with Governor McDonnell, other members of Virginia's government, and Cisco Systems, Inc. to launch 4-VA in response to three areas of Virginia's legislation:

1. The Governor's Higher Education Commission
2. The Governor's Commission on Economic Development & Job Creation
3. The Virginia Higher Education Opportunity Act of 2011, "Preparing for the Top Jobs of the 21st Century" (TJ21)

The focus on Science, Technology, Engineering, and Math (STEM) education and innovation to "better position Virginia to create jobs and grow the economy" led to a broad challenge for the universities that continues to guide the work of the growing collaborative. Early growth gained momentum and 4-VA continued to expand in scope and further develop its infrastructure. In early 2015, 4-VA welcomed Old Dominion University (ODU) as its newest member, and transferred management of the executive office to JMU. In 2016, 4-VA welcomed its sixth member institution, Virginia Commonwealth University (VCU).



Initiatives

Since 4-VA was established in 2011, the Campus Coordinators have sought to achieve the founding principles through aligning the goals and efforts of each campus with four key initiatives:

- Increase research dollars entering Virginia through seed grants for collaborative research.
- Define instructional models and decrease instructional costs through course redesign.
- Expand access for Virginians to higher education through cross-institutional course sharing.
- Increase the opportunities and success rate of

students in science, technology, engineering, and mathematics (STEM) by giving preference to STEM grant proposals.

To implement these founding principles the 4-VA collaborative leverages 4 initiatives where each initiative embodies one or more of the founding principles:

- Collaborative Research
- Course Redesign
- Course Sharing
- Degree Completion

Financial Summary

4-VA Collaborative

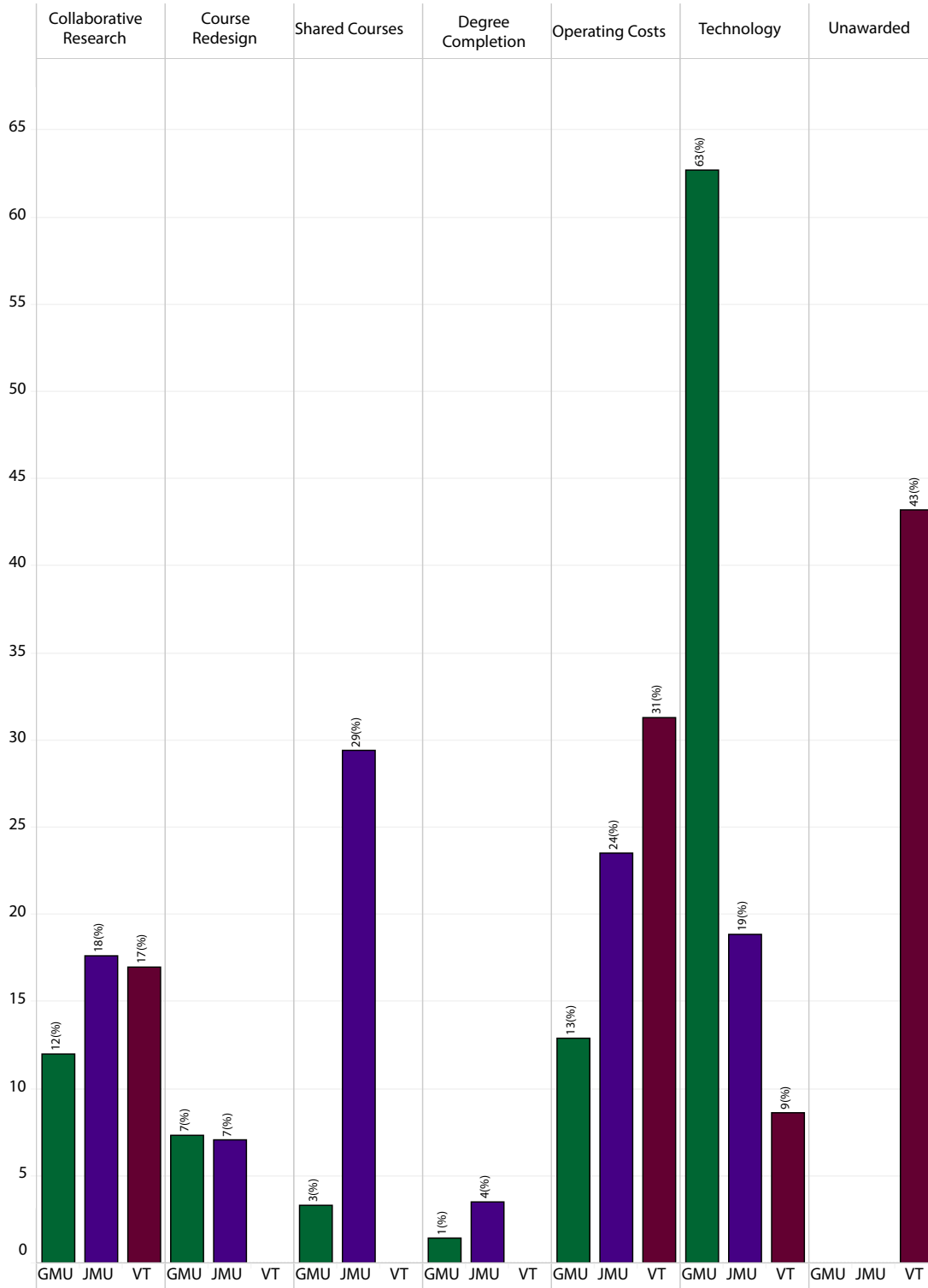
The table below includes 4-VA's financial statement for the 2016-2017 fiscal year. Please note, both ODU and VCU were active partners in 4-VA during this cycle, but neither received state funding. Since each campus issues both a call for proposals and makes awards during the calendar year, funds reported as awarded may not be the equivalent to funds spent. In light of the personnel turn-over during the 2016-2017 fiscal year, values reported are based on available archived data. Complete data from UVA was not available at the time of this report.

Initiatives	Amount	Percent Total
Collaborative Research	\$551,550	16%
Course Redesign	\$122,075	4%
Shared Courses	\$278,150	8%
Degree Completion	\$42,335	1%
Subtotal	\$994,110	29%
Administration	Amount	Percent Total
Operating	\$575,974	17%
Technology	\$765,814	23%
Subtotal	\$1,341,788	39%
Unawarded	\$1,064,102	31%
Totals	\$3,400,000	100%

4-VA Member Comparison

The implementation of 4-VA varies slightly between campuses and as such not all campuses participate in all 4-initiatives through directly awarding funds. The visual comparison shows some of these distinctions and highlights areas of investment.

2016-2017 Annual Report Budgets





2016-2017 George Mason University Highlights

At George Mason University (GMU), the 4-VA program provides significant support for projects that expand access to higher education including the redesign of courses to incorporate open education resources. GMU also provides seed funding for ground-breaking research in five important and fast-growing arenas. Three key projects funded during the 2016-2017 academic year were:

Computational Analysis of Microbial Evolution

Through a collaborative research effort between GMU, JMU, and VT, "Computational Analysis of Microbial Evolution: Building a Scaffold to Teach Next-Generation Sequencing in the Biology Department" aims to support the development of career pathways in bioinformatics. In Virginia in particular, bioinformatics is a burgeoning field. This project expanded GMU's curriculum in this area and provided a catalyst for computational approaches in the larger course of study.

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

— Principle Investigator, Dr. Reid Schwebach

SurgeNOW

The "SurgeNOW: Enabling real-time weather coastal flooding forecasts in the Chesapeake Bay" project was a multi-disciplinary effort between researchers at GMU and VT. The team of undergraduate students and graduate students from a wide range of disciplines --

engineering, geography, and computer science – came together to develop a unified, crowd sourced method of providing flood alerts in the Chesapeake Bay. The team leveraged Internet of Things technology which will help protect people and property in the Chesapeake area.

"This 4-VA grant allowed us to pull a wide range of people and resources together -- and brought this concept to life — we're taking great steps toward protecting Virginia's coastline and citizens."

— Principle Investigator, Dr. Celso Ferreira

The Virginia Food System Leadership Institute

In an effort that spans the 4-VA collaborative, "The Virginia Food System Leadership Institute (VFSLI)" supports food sustainability in Virginia. The grant brought together faculty, dining services personnel and sustainability managers from Virginia Tech, University of Virginia, James Madison University and George Mason University to develop and instruct GMU's CONS 497 and CONS 597 courses offered in collaboration with the Smithsonian-Mason School of Conservation in Front Royal, VA. Undergraduates learned from sustainability experts on promoting a more sustainable food system on university campuses as well as throughout the state.

"We designed the course not only to teach about food sustainability, but to involve students directly in creating strategies to get more Virginia-grown food into the dining halls at our public universities."

— Principle Investigator, Andrew Wingfield, M.F.A

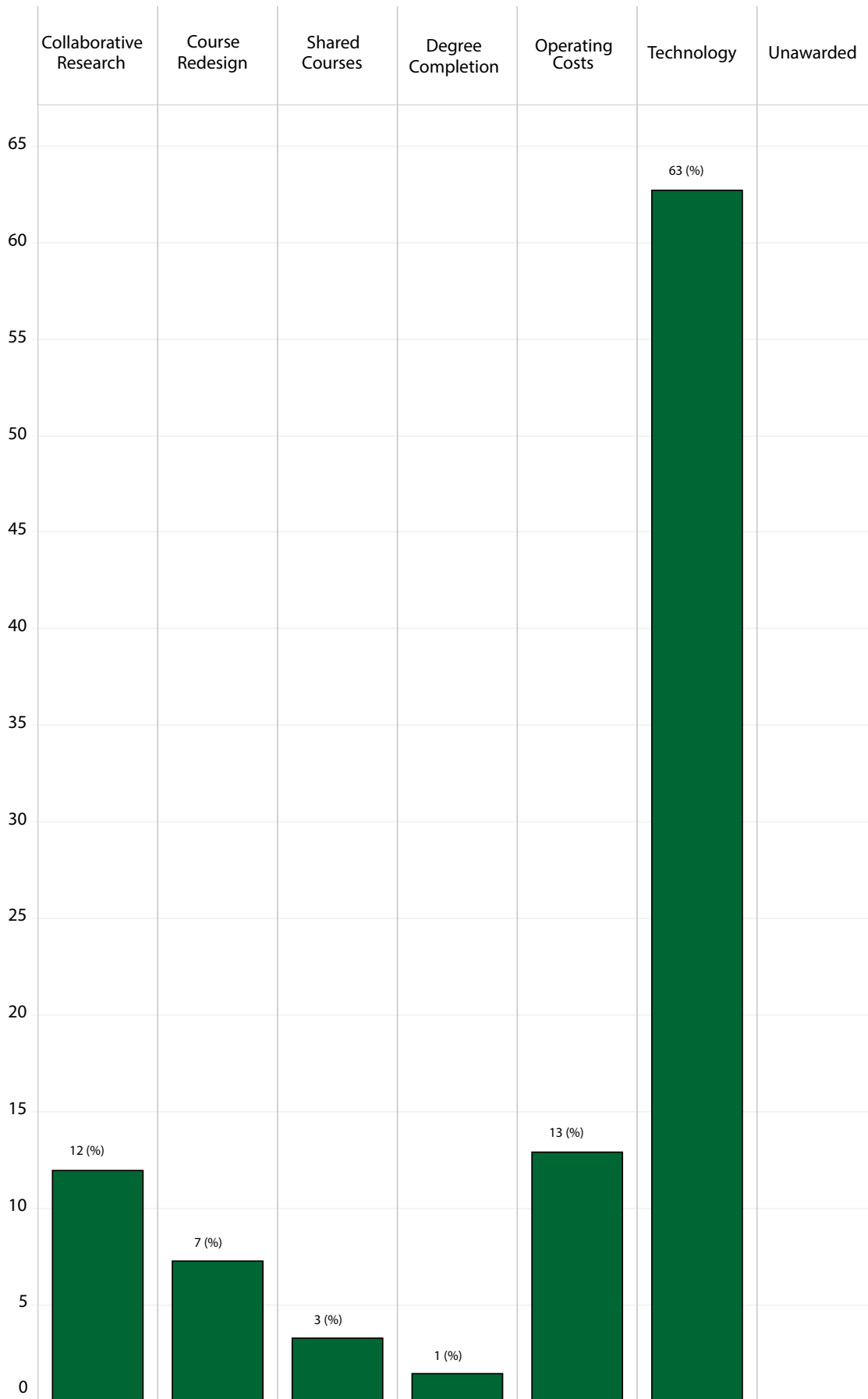


Initiatives	Amount	Percent Total
Collaborative Research	\$104,950	12%
Course Redesign	\$62,075	7%
Shared Courses	\$28,150	3%
Degree Completion	\$12,335	1%
Subtotal	\$207,510	24%

Administration	Amount	Percent Total
Operating	\$109,805	13%
Technology	\$532,685	63%
Subtotal	\$642,490	76%

Unawarded	\$0	0%
Totals	\$850,000	100%

GMU 2016-2017 Annual Report Budget





2016-2017 James Madison University Highlights

At James Madison University (JMU), the 4-VA program supports efforts in collaborative research, course redesign, course sharing, and degree completion. When possible course design grants often lead to course sharing with the 4-VA collaborative.

Hacking 4 Defense

The first ever undergraduate “Hacking 4 Defense” (H4D) course was offered at JMU in the spring of 2017 with support from Stanford University. Prior to this the Hacking 4 Defense (H4D) program at Stanford University on solving complex U.S. Department of Defense problems was exclusive to graduate students. JMU’s implementation involved the collaboration of 8 Faculty with an enrollment of 27 students. In the design-based course, students worked in teams to design:

- A prototype that seeks out enemy drones and incapacitates them
- A disaster relief mobile and internet app that crowdsources data from victims and first responders
- A means for battlefield commanders to visualize all aspects of the battlefield: physical, cyber, geo-spatial, electromagnetic, and social
- And more

“This is exactly what we had envisioned”
— Hacking 4 Defense Executive Director Darren Halford from Stanford University

“Saving lives is the true mission for this project”
— Hacking 4 Defense Student

“I wish education was more like this. It’s so much more rewarding”

— Hacking 4 Defense Student

International Physics Experts Meet at JMU; Workshop at the Madison Accelerator Laboratory (MAL)

In the spring of 2017, 4-VA awarded Dr. Adriana Banu \$12,500 to organize and host “A Workshop on the Science, Instrumentation and Education Program at the Madison Accelerator Laboratory (MAL)” with Dr. Kevin Giovanetti, Dr. Gabriel Niculescu, Dr. Ioana Niculescu and Dr. Scott Pendleton at JMU and Dr. Gail Dodge at ODU. Held in June of 2017, the two-day workshop featured 10 speakers and included experts from Greece and Turkey who have experience working with medical electron linear accelerators similar to the accelerator at the MAL. Also among the invited speakers were high-profile scientists from three major accelerator centers in the United States: the Idaho Accelerator Center, Jefferson Lab in Newport News, and the Triangle Universities Nuclear Laboratory in Durham, North Carolina. Overall, about 30 registered participants explored opportunities for using X-rays produced at the MAL for basic and applied research in a variety of fields.

The workshop also set the stage for course sharing possibilities that can leverage the new accelerator based environment for diverse areas of study including archaeology, art history,



astronomy, biology, environmental geochemistry, geology, materials science, medicine, and nuclear astrophysics.

“The outcomes of the workshop are very important for the future success of the Madison Accelerator Laboratory (MAL). Many collaborations were created on many fronts—fundamental research, interdisciplinary applied research, education and outreach. It also put MAL in the spotlight when it was featured in a Madison blog, a press release in the Daily News-Record, and a piece on the local TV station.”

— Principle Investigator, Dr. Adriana Banu

Biology Redesign

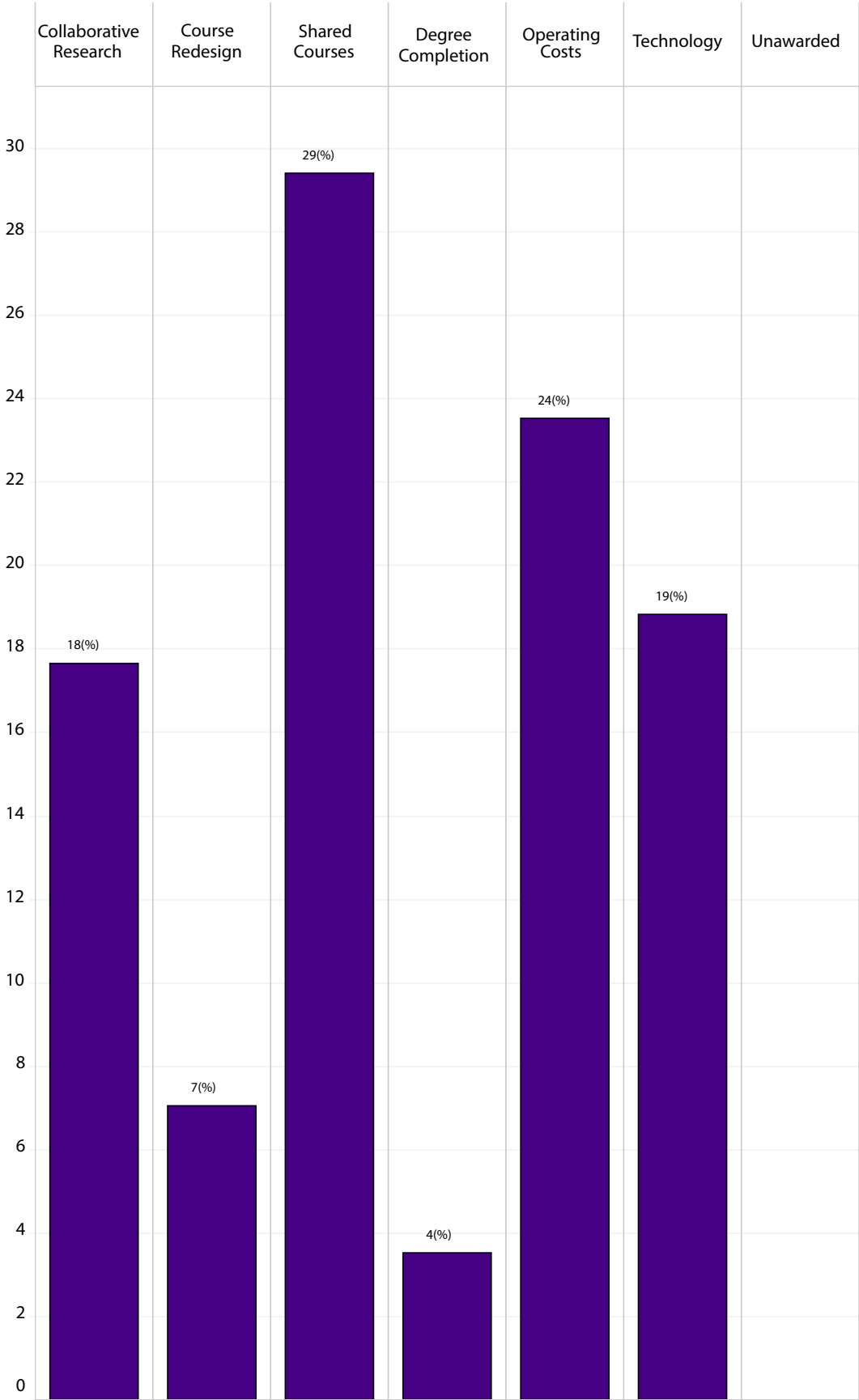
In response to the Vision and Change in Undergraduate Biology Education: A Call to Action report published by the American Association for the Advancement of Science, JMU developed an engaging, student-centered first-year experience for biology students in order to boost STEM retention rates.

“This curriculum redesign could not have happened without having excellent colleagues that have devoted countless hours to provide the best learning experience for our students. Support from 4-VA allowed many faculty to work together over multiple summers.”

— Dr. Kyle Seifert

Initiatives	Amount	Percent Total
Collaborative Research	\$150,000	18%
Course Redesign	\$60,000	7%
Shared Courses	\$250,000	29%
Degree Completion	\$30,000	4%
Subtotal	\$490,000	58%
Administration	Amount	Percent Total
Operating	\$200,000	24%
Technology	\$160,000	19%
Subtotal	\$360,000	42%
Unawarded	\$0	0%
Totals	\$850,000	100%

JMU 2016-2017 Annual Report Budget





UNIVERSITY *of* VIRGINIA

2016-2017 University of Virginia Highlights

At the University of Virginia (UVA), the 4-VA program provides significant support for the development of new research collaborations and/or multidisciplinary explorations.

The Novel Antimicrobial Peptides to Combat Drug-Resistant Pathogenic Bacteria

One collaborative research endeavor began in the spring 2017, between Alison Criss, associate professor, microbiology, immunology, and cancer biology, and Jayashim Rao, assistant professor of internal medicine, on "The Novel Antimicrobial

Peptides to Combat Drug-Resistant Pathogenic Bacteria." Primary investigator Dr. Criss was awarded for \$29,485 and collaborator Dr. Rao received \$5000. Their research aims to find new methods for fighting drug resistant bacteria as the threat of antibiotic-resistant bacteria continues to mount.

This research collaboration is providing undergraduate research experience to three students, one at University of Virginia and two at Virginia Tech. Drs. Criss and Rao have two planned publications already in progress and anticipate that the grant provided by 4-VA will

be a very important contribution to their external grant proposal, which they plan to submit after the projected completion date in June 2019.

It is [a] very fruitful experience working with [my] UVA collaborator. Using laboratory and departmental resources as well as using MDR strains of Gonococci in developing peptide based antimicrobials.

— Co-PI Dr. Jayashim Rao

Human-in-the-Loop Planning of Distributed Multi-Robot Teams for Emergency Response

Beginning in the spring of 2017, Primary Investigator Lu Feng from UVA teamed up with Pratap Tokekar from VT to explore new approaches for teams of multiple robots and humans to interact and collaborate effectively during emergency response situations. “Human-in-the-Loop Planning of Distributed Multi-Robot Teams for Emergency Response” was funded at \$40,000 total, \$30,000 at UVA and \$10,000 at VT. The objective of this project was to develop scalable methods for the mission planning of distributed multirobot teams that collaborate with human operators in emergency response. In the current practice, the robot operation in emergency response requires constant supervision of human operators. The project specifically, sought to develop a set of new algorithms and tools for the distributed planning and control of multi-robot teams that only needs high-level instructions rather than constant supervision from human operators.

“The 4-VA program has enabled me to write an external proposal with a co-PI who has the technical expertise and lab resources not available at my home institution.”

— Co-PI Dr. Pratap Tokekar

Extending a Fabrication Network (FabNet) to Other Virginia Schools and Universities

Primary award amount: \$29,790

In spring 2017, Glen Bull from UVA and David Slykhuis from JMU initiated a collaborative research partnership on the maker movement. The maker movement is building capacity for innovation both in schools and in community settings. Once a digital design or CAD file has been developed, it can potentially be disseminated to other sites across the network. To capitalize on this potential for collaboration, the “Extending a Fabrication Network (FabNet) to Other Virginia Schools and Universities” project sought to establish a prototype fabrication network, FabNet. UVA funded the project at \$29,790. The FabNet coalition sought to extend the existing work at UVA to include JMU, other Virginia schools, and educational associations such as the Society for Information Technology and Teacher Education (SITE), and the Smithsonian Institution. The coalition focused on advancing maker education to support engagement and experiential learning in STEM fields promoting affordable and usable scaffolding for the effective use of maker technologies in primary schools, secondary schools, community colleges, and universities.





VIRGINIA TECH™



2016-2017 Virginia Tech Highlights

At Virginia Tech, the 4-VA program provides support for collaborative research with a particular interest in efforts that lead to new research collaborations.

Improving Hands-on Groundwater Hydrology Education at 4-VA Institutions

In 2016 Gary Glesener, director of the geosciences modeling and educational demo lab began a collaborative endeavor among the 4-VA institutions to improve education on groundwater hydrology by improving and reducing the cost of essential tools to a fraction of the off-the-shelf cost. The “Improving Hands-on Groundwater Hydrology Education at 4-VA Institutions” grant was awarded \$5000 and includes collaborators Madeline Schreiber from Virginia Tech (VT), Yonathan Admassu from James Madison University (JMU), L. Scott Eaton from JMU, Rich Whittecar from Old Dominion University (ODU), and Laura Lukes from George Mason University (GMU). Collaborators report that the endeavor helped to both create and strengthen research collaborations. Additionally, significant progress was made on the design, evaluation, and refinement of the hydrology lab equipment during 2017; completion of work is expected January of 2019.

“We were able to able to collectively create ideas and vision for improving our courses.”

— Primary Investigator, Dr. Gary Glesener

Systems versus Linear Thinking: Measuring Cognitive Network Coordination for Tasks about Sustainability

Beginning in 2017, collaborators Tripp Shealy from Virginia Tech (VT), Elise Barrella from JMU, Leidy Klotz from University of Virginia (UVA), and Robin K. Panneton, from VT joined forces to study “Systems versus Linear Thinking: Measuring Cognitive Network Coordination for Tasks about Sustainability”. Primary investigator, Tripp Shealy was awarded \$20,000 to explore solutions to sustainability challenges like poverty, climate change, and water availability through systems thinking. The collaboration included three undergraduate and three graduate researchers and led to five accepted conference papers and two (in-progress) journal articles. Primary Investigator Dr. Shealy reported that the 4-VA grant was very important to the team’s competitiveness for external research funding.



"[4-VA provided] access to a diverse group of students, resources and expertise. I continue to work closely with the collaborators at JMU and UVA."

— Primary Investigator, Dr. Shealy

Novel strategies for breaking down platelet-mediated extravasation of cancer cells

Using a multidisciplinary team on the Virginia Tech and University of Virginia campuses, Daniel Capelluto, David Bevan, Carla V. Finkielstein, and Richey Davis from VT collaborated with Jeffrey F. Ellena from UVA on a 2-year project involving faculty, graduate, and undergraduate students. Using \$20,000 provided at VT and \$5000 provided at UVA, the team tackled platelet-mediated migration of cancer cells from circulation to new tissues and further development of a new tumor,

a phenomenon known as metastasis. In addition to the wide variety of expertise, including chemical engineering, biological sciences, biochemistry and bimolecular magnetic resonance, the team reports that 4-VA has facilitated the sharing of equipment, maximizing of university resources, and provided professional development opportunities for graduate students. The team has 3 submissions for external funding in progress and plan to complete the project in summer of 2019.

"Our collaboration to the University of Virginia is crucial. They have a suitable NMR facility with instruments that we do not have at Virginia Tech. We have sent samples to them for unrelated projects."

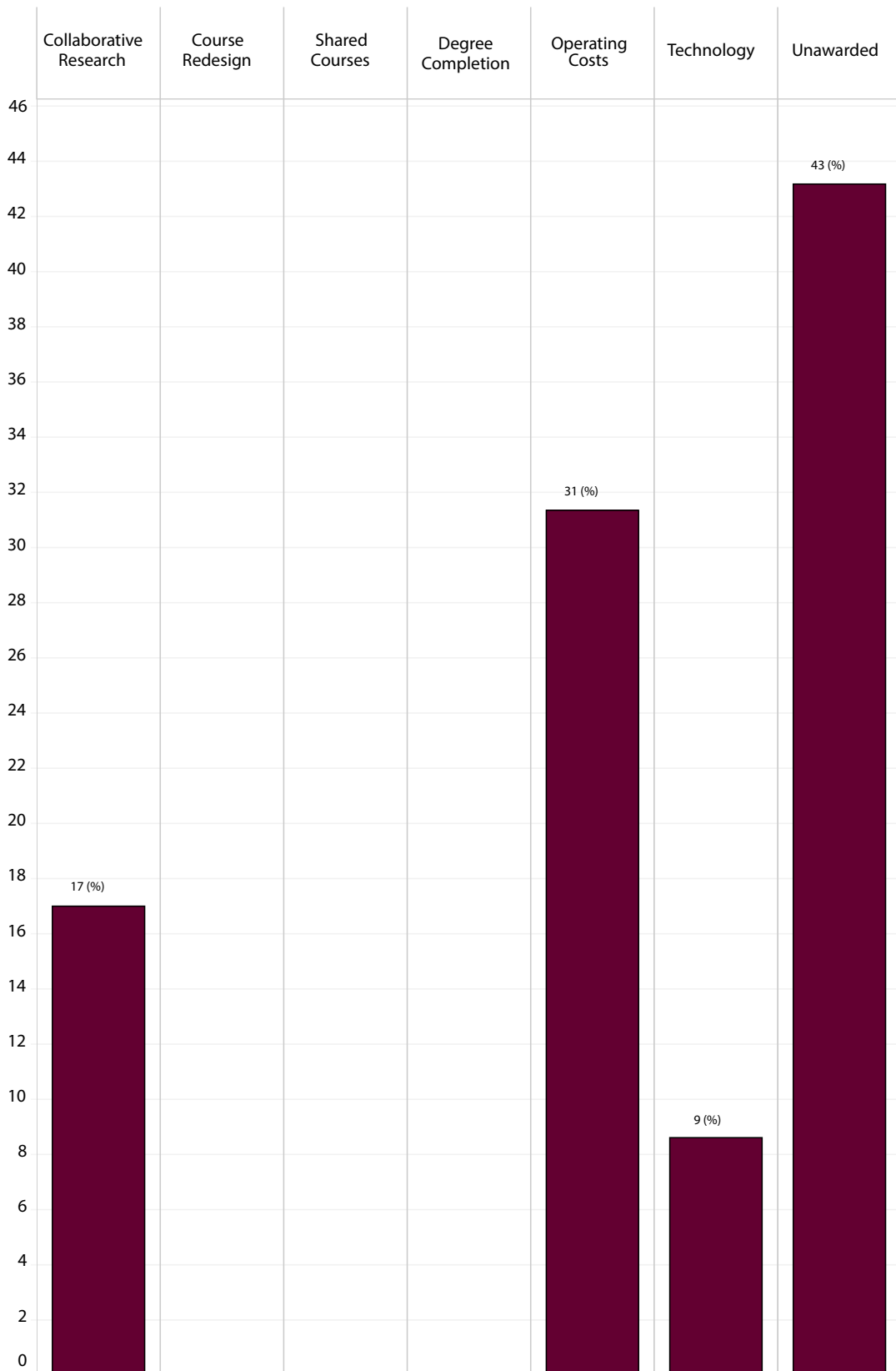
— Primary Investigator, Dr. Daniel Capelluto

Initiatives	Amount	Percent Total
Collaborative Research	\$143,750	17%
Course Redesign	\$0	0%
Shared Courses	\$0	0%
Degree Completion	\$0	0%
Subtotal	\$143,750	17%

Administration	Amount	Percent Total
Operating	\$266,169	31%
Technology	\$73,129	9%
Subtotal	\$339,298	40%

Unawarded	\$366,952	43%
Totals	\$850,000	100%

VT 2016-2017 Annual Report Budget





OLD DOMINION UNIVERSITY

2016-2017 Old Dominion University Highlights

The Virginia Drones Project

In its third iteration during Fall 2016, the unmanned aerial vehicle (UAV) course, which originates at JMU, became an applied UAV course in collaboration with GMU and ODU. The course involved 14 faculty and had 38 students enrolled from 21 disciplines. Through team-based design projects, students developed solutions to UAV:

- Augmented communication
- Fire rescue
- Increasing honeybee populations
- Landmine detection
- Modeling city walls for preservation in Cartagena, Colombia
- And more

As a direct result of this course, students from this course traveled to Cartagena, Colombia to test the prototype with great success. Several students from the

course graduated and went on to start a business called Canvex, which uses drones to create 3D models, realistic virtual reality content, aerial pictures, and large-scale agricultural analysis.

The General Education Summit

A collaborative endeavor initiated by Stephen Biscotte of VT, members of the general education community at ODU joined collaborators from GMU, JMU, UVA and VCU in planning a Summit to be held at VT in October of 2017. The leadership team, consisted of representatives from all six 4-VA campuses who developed the agenda and key areas for discussion during monthly meetings which leveraged the same Cisco Telepresence rooms as the 4-VA shared courses. Results of the event and continued work will be presented in the 2017-2018 report.



VCU

2016-2017 Virginia Commonwealth University Highlights

On June 1, 2017, 4-VA formally accepted Virginia Commonwealth University (VCU) as the sixth 4-VA partner institution. As the premier urban, public research university in Virginia, VCU has a large and growing research enterprise, a diverse student body, and a collaborative nature that fits 4-VA's initiatives. With over 2,000 full-time faculty, VCU offers a large, collaborative research environment. The university has more than 31,000 students who come from 102 countries, making it one of the most racially and ethnically diverse schools in the U.S. To serve this large population of students and researchers, the university is expanding their online presence, which will help 4-VA improve

access to higher education and help more Virginians complete their degrees.

VCU's addition to the collaborative will promote new educational and research collaborations in Virginia. While VCU has a long history of productive relationships with the individual 4-VA institutions, this formal partnership will leverage the best each has to offer and will improve services to students throughout Virginia.



About the Collaborative

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