JLARC
JOINT LEGISLATIVE AUDIT AND REVIEW COMMISSION

REPORT TO THE
GOVERNOR AND THE GENERAL ASSEMBLY OF VIRGINIA

Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions

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COMMONWEALTH of VIRGINIA

Joint Legislative Audit and Review Commission
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April 4, 2014

The Honorable John M. O'Bannon III, Chair
Joint Legislative Audit and Review Commission
General Assembly Building
Richmond, Virginia 23219

Dear Delegate O'Bannon:

Senate Joint Resolution 108 of the 2012 General Assembly directed the Joint Legislative Audit and Review Commission to review the cost efficiency of the Commonwealth's institutions of higher education and to identify opportunities to reduce the cost of public higher education in Virginia. This is the third report in a series of reports under HJR 108 that will be released during 2013 and 2014.

This report was briefed to the Commission and authorized for printing on December 9, 2013. On behalf of the Commission staff, I would like to thank the staff of the Secretary of Education and the State Council for Higher Education in Virginia for assistance during this review. I would also like to acknowledge many staff members of Virginia's 15 public four-year higher education institutions, who were very accommodating to our research team.

Sincerely,

Hal E. Greer

Hal E. Greer
Director

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Abbreviations

Assignable Square Feet	ASF
Christopher Newport University	CNU
College and University Professional Association for Human Resources	CUPA-HR
College of William and Mary	CWM
Commonwealth Research Commercialization Fund	CRCF
Commonwealth Research Initiative	CRI
Department of General Services	DGS
Department of Planning and Budget	DPB
Education & General	E&G
Full-Time Equivalent	FTE
George Mason University	GMU
Higher Education Equipment Trust Fund	HEETF
James Madison University	JMU
Leadership in Energy and Environmental Design	LEED
Longwood University	LU
Norfolk State University	NSU
Oklahoma State University	OSU
Old Dominion University	ODU
Operation and Maintenance	O&M
Radford University	RU
Science, Technology, Engineering, Mathematics, and Health	STEM-H
Six Year Capital Outlay Plan Advisory Committee	6PAC
State Council of Higher Education for Virginia	SCHEV
Teaching and Research	T&R
University of Mary Washington	UMW
University of Virginia	UVA
University of Virginia – Wise	UVA-W
Virginia College Building Authority	VCBA
Virginia Commonwealth University	VCU
Virginia Military Institute	VMI
Virginia State University	VSU
Virginia Tech	VT

JLARC Report Summary: Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions

Key Findings

- A major driver of rising faculty costs in recent years has been growth in the number of faculty to keep pace with increasing student enrollment. Faculty salaries in Virginia fall below State and national benchmarks of competitiveness, and the State's process to compare faculty salaries could be improved (Chapter 2).
- Tenured and tenure-track faculty are teaching marginally less than in previous years. Teaching loads are generally consistent with national averages (Chapter 3).
- Instruction is increasingly provided by higher cost research schools and in more costly STEM-H disciplines. The State's emphasis on STEM-H will likely continue to increase costs (Chapter 5).
- Academic research benefits students and the local economy. It also results in nearly $300 million in additional costs at Virginia's research institutions, some of which is funded by tuition and fees (Chapter 6).
- Institutions spent over $3 billion on the construction and renovation of academic facilities between FY 2005 and FY 2012, during which time State policies for capital planning were not consistently followed. Instructional space per student and research space per $1 million in research activity increased during this time (Chapter 7).

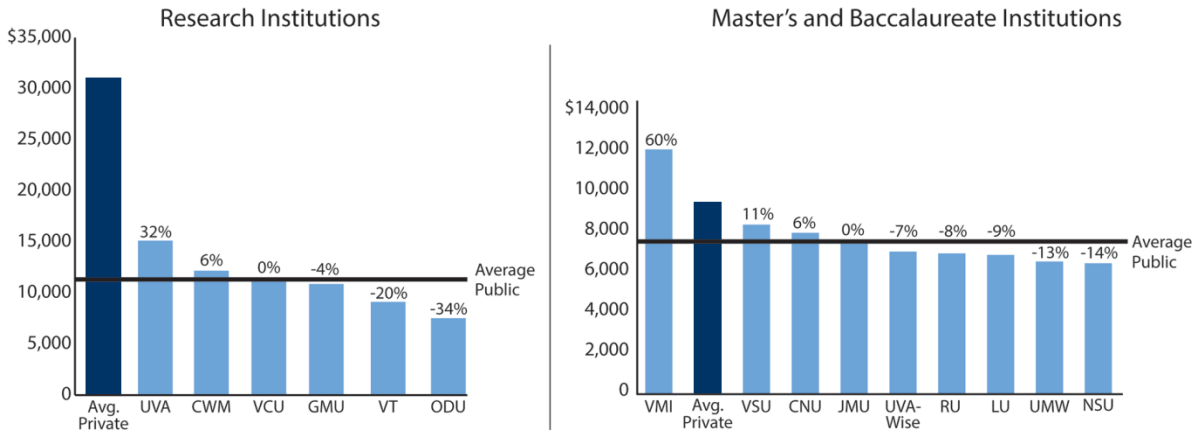
House Joint Resolution 108 (2012) directs the Joint Legislative Audit and Review Commission (JLARC) to study the cost efficiency of Virginia's institutions of higher education and to identify opportunities to reduce the cost of public higher education. The overarching intent of the resolution is, amid substantial increases in tuition and fees, to assess the major drivers of cost at Virginia's 15 public higher education institutions (Appendix A).

Given the broad scope of this review, a series of reports will be completed under HJR 108 during 2013 and 2014. This third report in the series addresses instructional and research spending. This report includes six recommendations. Broader options and recommendations for improving efficiency and managing costs will be included in the final report of the series. These will address major academic, administrative, and auxiliary enterprise concerns identified in the series.

SPENDING ON INSTRUCTION AND RESEARCH IS SUBSTANTIAL BUT NOT ABOVE NATIONAL AVERAGES

Virginia's higher education institutions collectively spent over $2.4 billion on instruction and research in FY 2011. Instructional spending per student at most Virginia institutions is at or below

Instructional Spending per FTE Student Is At or Below the National Average for Public Institutions at Most Virginia Institutions (FY 2011)



Note: Percentages indicate differences from national average for public institutions.

Source: JLARC staff analysis of National Center for Education Statistics data.

average for public institutions nationwide. Virginia ranked 37th among states in academic research expenditures per capita. The national average for higher education research spending per capita was $207 in FY 2011, and it was $159 per capita in Virginia.

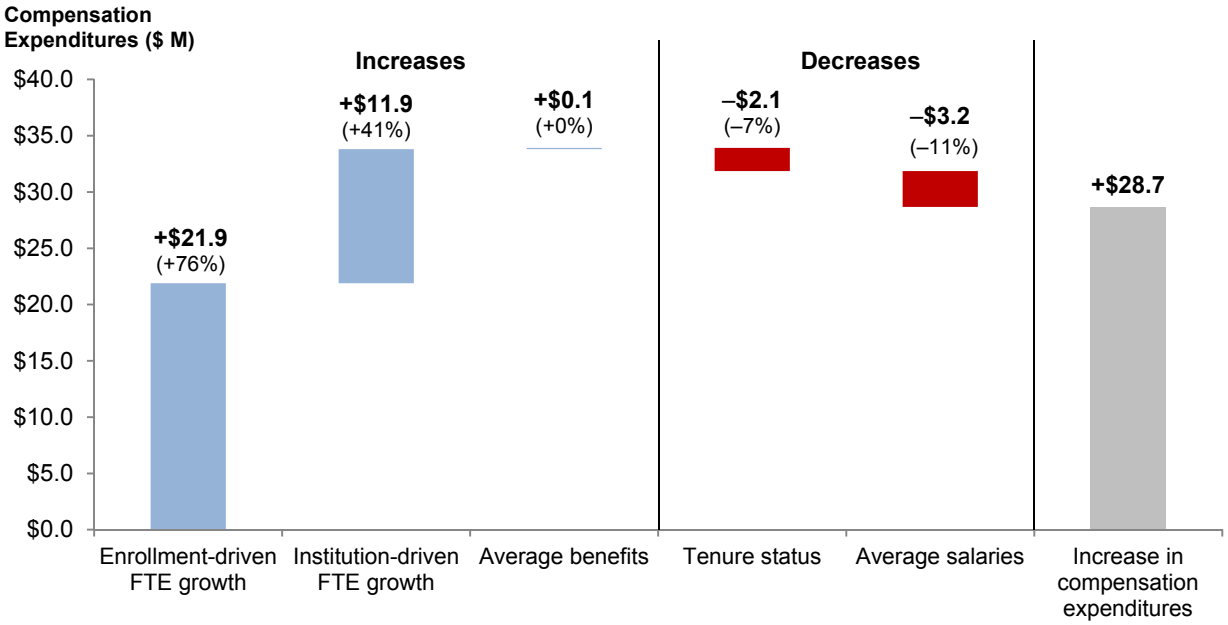
Institutional Spending on Faculty Increased, Largely to Keep Pace with Enrollment Growth

In FY 2012, Virginia's institutions spent $1.4 billion on faculty salaries and benefits, which represent their largest instructional expenditure. Between FY 2005 and FY 2012, spending on compensation increased by 17 percent in constant dollars. The increase in spending on faculty compensation was largely driven by increases in the number of faculty needed to accommodate student enrollment growth at Virginia's institutions.

At master's and baccalaureate institutions, enrollment-driven faculty FTE growth led to $21.9 million in increased compensation expenditures. Some institutions also added faculty to decrease student-faculty ratios or reduce instructional workloads. This resulted in $11.9 million in increased compensation expenditures. A decline in average salaries (in constant dollars) and a decrease in the proportion of tenured and tenure-track faculty helped slow the growth in spending at master's and baccalaureate institutions.

At research institutions, enrollment-driven faculty FTE growth accounted for $81 million in increased compensation expenditures. Rising average salaries at research institutions and increased numbers of research faculty also contributed to a combined $37.8 million in increased compensation expenditures. A decrease

Increase in Faculty FTEs Accounted for Majority of Increased Compensation Spending at Master's and Baccalaureate Institutions (FY 2005–FY 2012)



Note: Data shown are for T&R faculty at CNU, JMU, RU, UMW, UVA-W, and VMI combined. LU, NSU, and VSU were unable to provide complete compensation expenditures for FY 2005 and are excluded. Enrollment growth is measured by student credit hours. Numbers may not add due to rounding. Expenditures are in constant 2011 dollars.

Source: JLARC staff analysis of institutionally reported data and SCH data provided by SCHEV.

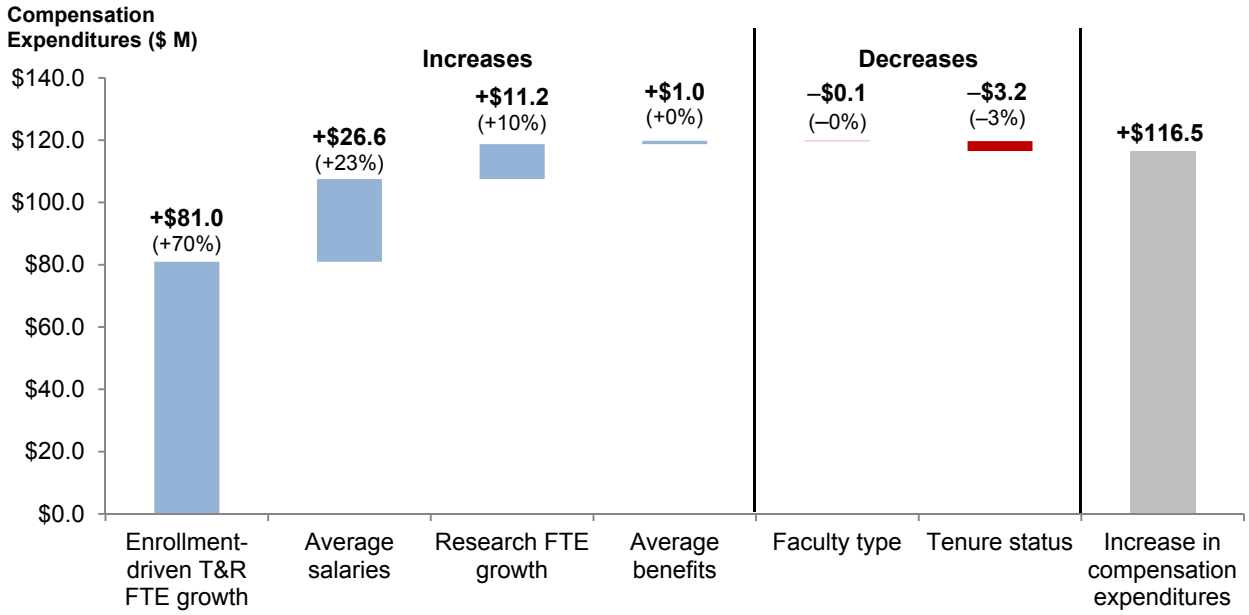
in the proportion of tenured and tenure-track faculty helped slow the growth in spending at research institutions.

Average Faculty Salaries Fall Substantially Below State's Policy Goal, and Process to Compare Salaries Could Be Improved

Virginia has a faculty salary goal of meeting the 60th percentile of each institution's State-approved peer group. However, the public four-year institutions have collectively attained the 60th percentile goal only three times during the past 24 years. Only one institution met this goal in FY 2012. Comparisons of faculty salaries in Virginia to faculty salaries nationwide reveal similar findings. Consequently, faculty salaries do not appear to be an area in which institutions can become significantly more cost efficient.

There are several improvements that the State should make to compare and fund faculty salaries. The report recommends that appropriated salaries be re-based against actual average salaries. Salary benchmarking should also be done at the discipline level rather than institution-wide to facilitate more precise and relevant salary comparisons.

Increase in Faculty FTEs Due to Enrollment Growth Accounted for Majority of Increased Compensation Spending at Research Institutions (FY 2005–FY 2012)



Note: Data shown are for T&R and research faculty at GMU, ODU, UVA, and VT combined. CWM and VCU were unable to provide complete compensation expenditures for FY 2005 and are excluded. Part-time benefit expenditures at VT are excluded, as VT was unable to provide FTE for recipients. Numbers may not add due to rounding. Enrollment growth measured by student credit hours. Expenditures are in constant 2011 dollars.

Source: JLARC staff analysis of institutionally reported data and SCH data provided by SCHEV.

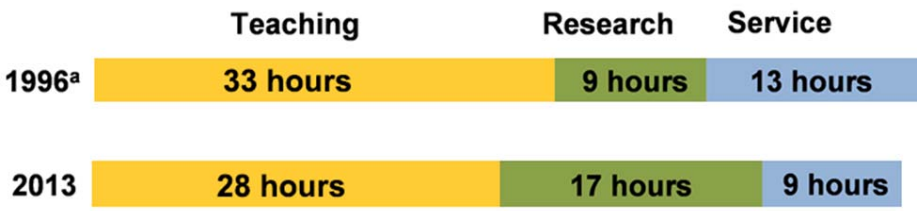
Some Virginia Institutions Have Increased Reliance on Contingent Faculty, But Overall Reliance Is Lower Than National Average

Contingent faculty include both non-tenure-track faculty and supplemental faculty, such as adjunct faculty. These faculty are typically less expensive than tenured and tenure-track faculty because they are paid less and, in the case of supplemental faculty, do not receive benefits. In FY 2012 contingent faculty comprised 37 percent of faculty in Virginia, which is considerably less than the national average. While the proportion of contingent faculty has remained relatively consistent statewide, some institutions have increased their reliance on contingent faculty. Although this strategy accommodates enrollment growth while constraining instructional spending, its effects on instructional quality are uncertain.

Faculty Spend More Time on Research and Less Time on Teaching and Service

Full-time faculty in Virginia reported working an average of 54 hours per week in 2013. This is comparable to the weekly hours worked by faculty in Virginia in 1996. However, faculty reported

Faculty Report Spending More Time on Research and Less Time on Teaching and Service Activities in 2013 Than in 1996



Note: Data represents full-time teaching and research faculty.

[a] Professional development activities, which accounted for 2.9 hours and were originally categorized as research activities in the 1996 survey, are recategorized as service activities in this figure for consistency with the 2013 survey.

Source: JLARC staff analysis of two surveys of faculty in Virginia (the 2013 survey by JLARC staff and a 1996 survey by SCHEV).

spending more time on research and less time on teaching and service activities than in the past.

Tenured and Tenure-Track Faculty Are Teaching Marginally Less Than Previously

Changes in faculty composition and faculty teaching loads can impact the extent to which students are taught by a given type of faculty member. Teaching loads have declined marginally for tenured and tenure-track faculty at most institutions. This decrease combined with the slight increase in the proportion of contingent faculty has resulted in a modest decline in the percentage of student credit hours taught by tenured and tenure-track faculty, particularly at research institutions. Still, average faculty teaching loads across all faculty types in Virginia are not consistently above or below national averages.

Instruction Is Increasingly Provided by Higher Cost Research Institutions in More Costly STEM-H Disciplines

The majority of recent enrollment growth at Virginia's institutions has occurred at the six research institutions. Growth in instruction at research institutions accounted for 65 percent of the increase in total instructional spending at Virginia's institutions between FY 2005 and FY 2012. Although inflation-adjusted instructional spending per student credit hour actually declined by two percent at research institutions between FY 2005 and FY 2012, average instructional spending per student credit hour is approximately 50 percent higher at research institutions than at master's and baccalaureate institutions.

Statewide, the share of total instruction taking place in higher cost science, technology, engineering, math, and health (STEM-H) disciplines also increased somewhat between FY 2005 and FY 2012.

The trend toward higher cost STEM-H programs will likely continue with the emphasis on STEM-H in Virginia and nationwide.

Academic Research Yields Many Benefits But Costs Institutions Nearly $300 Million

In FY 2011, Virginia's six research institutions spent approximately $1.2 billion on research and development activities. Undergraduate and graduate students benefit from research activity at their institutions, and academic research increases employment and economic activity. However, research also leads to institutional costs, and institutions fund over one-fifth of academic research activity statewide. While institutions receive large amounts of funding from external sponsors, such as the federal government, funding from sponsors typically does not cover the full direct and indirect costs of research projects. Additionally, institutions undertake research efforts that do not receive external funding. Virginia's research institutions incurred nearly $300 million in research costs in FY 2011. These costs were covered through a variety of funding sources, including tuition and fees paid by students.

Institutions Spent Substantially to Increase Instructional and Research Space Without Following State Capital Processes

A State capital planning process, which includes higher education, was established in 2008. Since its adoption, this process does not appear to have been consistently followed by higher education institutions. SCHEV has a prioritization process for higher education capital planning, which has had limited influence on which projects receive funding. Not following the established capital planning processes has coincided with substantial expenditures on construction ($2.5 billion) and renovation ($901 million) of instructional and research space between FY 2005 and FY 2012. Through this spending, instructional space per student increased seven percent at master's and baccalaureate institutions and four percent at research institutions. Research space increased by 17 percent per $1 million in research activity at research institutions.

Following established capital processes will be important given institutions' recent requests for $6.5 billion for State-supported capital projects between FY 2014 and FY 2020. In addition, SCHEV has space utilization guidelines, which help inform the prioritization process. The instructional space guidelines are based on standards that are nearly 40 years old and do not reflect current uses of instructional space; they significantly overestimate the amount of research space needed. This report recommends that SCHEV's space utilization guidelines be updated to adequately measure the current use of space and plans for future use of space.

Chapter 1

Spending on Instruction and Research Is Substantial But Not Above National Averages

In Summary

Instruction and research make up the majority of educational and general (E&G) spending at Virginia's public four-year higher education institutions. The State provided $1.1 billion in general funds for E&G in FY 2014, including funds for instruction. In addition, the State provided over $40 million in FY 2014 through various sources to support research. State funding guidelines and policies for instruction and research are either largely unmet by the State or nonexistent. Despite varying levels of State support in these areas over the past decade, total institutional spending for instruction and research has continued to increase in Virginia. Still, for most Virginia institutions, instructional spending per student is at or below the national average. Spending on research per capita at Virginia's institutions is comparable to spending levels in the Southeast region of the U.S. and substantially below the national average.

House Joint Resolution 108 (2012) directs the Joint Legislative Audit and Review Commission (JLARC) to study the cost efficiency of Virginia's institutions of higher education and to identify opportunities to reduce the cost of public higher education. The overarching intent of the resolution is to assess the major drivers of costs at Virginia's 15 public higher education institutions amid substantial increases in tuition and fees (Appendix A).

Given the broad scope of this review, a series of reports will be completed under HJR 108 during 2013 and 2014. This third report in the series addresses instructional and research spending.

MAJORITY OF EDUCATIONAL AND GENERAL SPENDING IS FOR INSTRUCTION AND RESEARCH

The term Educational and General (E&G) is used to describe operations related to an institution's educational objectives. E&G activities include those associated with instruction; research; public service; academic support, such as libraries and academic computing; student services, such as career counseling and student health services; institutional support, including central administration; and operation and maintenance. E&G is the largest category of spending for higher education institutions. In 2010-2011, Virginia's institutions spent a total of $3.9 billion on E&G operations, which was 78 percent of total institutional operational spending. Totals do not include hospital services (except for the Veterinary Teaching Hospital at Virginia Tech) or unique military operations.

Report Uses Carnegie Classification to Group and Compare Institutions

As discussed in the 2013 JLARC report, *Trends in Higher Education Funding, Enrollment, and Student Costs*, there is wide variation across Virginia's public four-year higher education institutions in the programs and degrees they offer, as well as their mission. As a result, comparisons of instructional and research spending across all four-year institutions may be of limited value.

Grouping institutions with similar academic missions frequently yields useful comparisons of spending. The Carnegie Classification of Institutions of Higher Education, the tool used for this study, is widely used in U.S. higher education. In the Carnegie classification framework, institutions are categorized as doctorate-granting universities, master's colleges and universities, or baccalaureate colleges, on the basis of the degrees they award. Within those categories, institutions are further classified (Table 1).

Carnegie Classification Framework

Doctorate-granting universities are classified as "very high research activity" and "high research activity" based on factors such as aggregate R&D expenditures and R&D expenditures per faculty member. Master's colleges and universities are classified by size based on the number of master's degrees awarded. Virginia's baccalaureate colleges are classified as Arts & Sciences (as opposed to other classifications of baccalaureate colleges) because at least half of bachelor's degree majors are in the arts and sciences.

Table 1: Virginia's Public Four-Year Institutions Have Varying Missions

Institution	Mission
Research (doctorate-granting) universities	
UVA	Very high research activity
VCU	Very high research activity
VT	Very high research activity
CWM	High research activity
GMU	High research activity
ODU	High research activity
Master's colleges and universities	
JMU	Larger programs
NSU	Larger programs
RU	Larger programs
UMW	Larger programs
LU	Medium programs
CNU	Smaller programs
VSU	Smaller programs
Baccalaureate colleges	
UVA-W	Arts & Sciences
VMI	Arts & Sciences

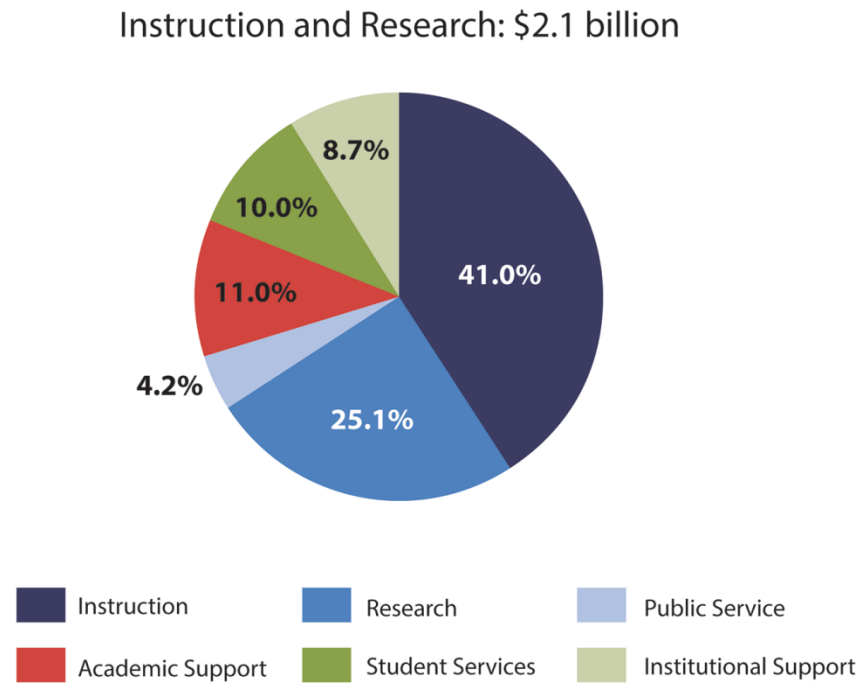
Source: Carnegie Foundation for the Advancement of Teaching (2010).

In most cases, this report uses two main categories: research (doctorate granting) institutions, and master's and baccalaureate institutions.

Two-Thirds of E&G Spending at Virginia's Research Institutions Is on Instruction and Research

The largest portion of E&G spending across higher education institutions is for instruction and research. Research institutions spent a total of $2.1 billion on these two areas (including externally funded research) in 2010-2011. Instruction was 41 percent of E&G spending, and research was approximately 25 percent of spending (Figure 1).

Figure 1: Instruction and Research Was 66 Percent of E&G Spending at Research Institutions in 2010-11

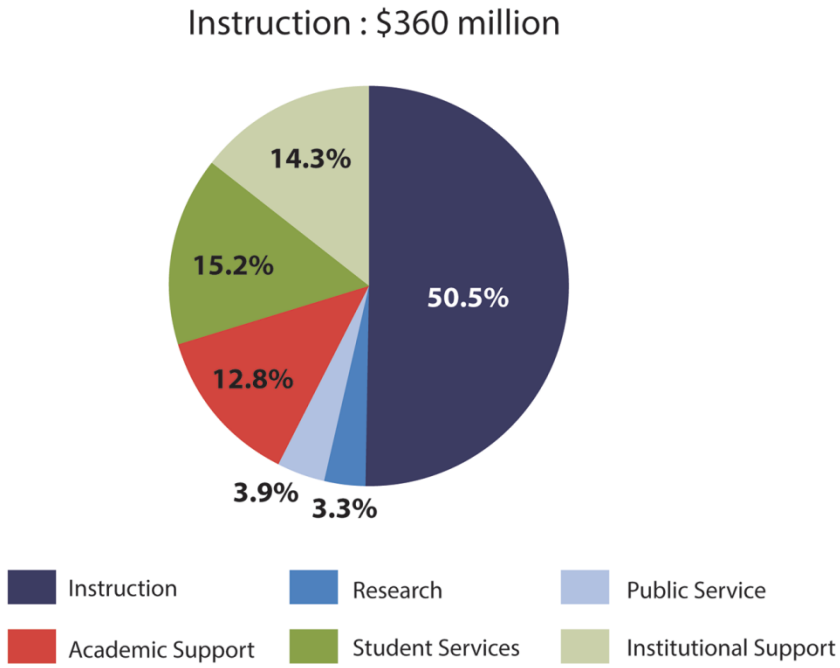


Source: JLARC staff analysis of information reported by institutions to the National Center for Educational Statistics.

In Virginia, About Half of E&G Spending at Public Master's and Baccalaureate Institutions Is on Instruction

The largest portion of spending at master's and baccalaureate institutions is on instruction. Master's and baccalaureate institutions spent a total of $360 million on instruction in 2010-2011, which was about half of E&G expenditures (Figure 2). In contrast, research was only approximately three percent of E&G expenditures at these institutions.

Figure 2: Instruction Was Half of E&G Spending at Master's and Baccalaureate Institutions in 2010-11



Source: JLARC staff analysis of information reported by institutions to the National Center for Educational Statistics.

Facilities for Instruction and Research Constitute Another Substantial Spending Category

In addition to the operational spending, substantial investments have recently been made in facilities for instruction and research. Between FY 2005 and FY 2012, Virginia institutions spent nearly $3.4 billion for the construction and renovation of instructional and research facilities. Most of this spending was funded by State-issued debt and institutional funds.

INSTRUCTIONAL SPENDING GROWTH HAS SLOWED, AND MOST VIRGINIA INSTITUTIONS SPEND AT OR BELOW NATIONAL AVERAGES ON INSTRUCTION

Aggregate spending on instruction increased at Virginia's higher education institutions by over 50 percent during the past decade. Enrollment also increased significantly during this time. On a per-student basis, instruction was not the primary driver of increased spending at Virginia's institutions. (See JLARC's 2013 report, *Trends in Higher Education Funding, Enrollment, and Student Costs*.) Spending on instruction in Virginia is comparable to or below spending on instruction at public institutions nationwide.

State Has Established Instructional Funding Formula and Goals, Which Are Not Met

General fund support for instruction is part of the broader State appropriation for E&G activities. Over the past decade, Virginia institutions experienced a reduction in general fund support for E&G as a result of the nationwide recession that occurred in 2008 and 2009. In the past two years, general fund support for E&G started to increase, with the State providing nearly $1.1 billion in general funds for E&G in FY 2014 (not including capital support for E&G).

Although the State provides large amounts of funding for instruction through the E&G budget, State funding guidelines and policies for higher education instruction are largely unmet. The State's current policy is framed by the Virginia Higher Education Opportunity Act of 2011, which sets forth various funding guidelines and goals. The three primary guidelines framing instructional funding are the calculation of each institution's basic operational and instructional funding need, the State's cost-sharing goal, and the State's faculty salary goal. These guidelines existed prior to the Act and were incorporated into the Act. In addition, the Act states that funding should be provided to incentivize enrollment growth and for other State priorities, such as increasing degree production in specified areas.

The Act States That the State Council of Higher Education for Virginia (SCHEV) Shall Calculate Each Institution's Basic Operations and Instruction Funding Need. SCHEV calculates institutions' basic funding need using the base adequacy funding methodology that was adopted by the Joint Subcommittee on Higher Education Funding Policies in 2001. The instructional funding need is largely driven by student-faculty ratios, which vary by course level and discipline, and student enrollment. The instructional funding need calculation also recognizes non-faculty instructional costs, including support staff, instructional material, and equipment. (In addition to instructional funding, the base adequacy model addresses other support needs, such as academic support, student services, and institutional support.) As of FY 2014, the base adequacy model was funded at an average of 96 percent of the guideline statewide for the four-year institutions (excluding those institutions that are at or above the guideline). This is largely due to tuition and fees rather than State support.

The Act Indicates That the State's Cost-Sharing Goal Should Be Considered When Higher Education Funding Levels are Determined. The State's cost-sharing goal, which was adopted in 2004, is as follows: the General Assembly shall seek to cover at least 67 percent of an institution's cost of education for in-state students (according to the base adequacy guidelines) through the State gen-

eral fund. The remaining amount should come from funds other than the State general fund, including tuition and fees. (Out-of-state students are required to pay at least 100 percent of their costs.) In the 2013 legislative session, the Virginia General Assembly provided an additional $11 million in general funds to support base operations, including the base adequacy guidelines. However, as of FY 2014, SCHEV reports that general funds are projected to cover only 49 percent of educational costs for in-state undergraduate students, on average.

The Act Indicates That Institutions' Basic Operation and Instructional Funding Need Should Include the Amount Required to Reach the Faculty Salary Goal of 60th Percentile of Peers. The salary goal of the 60th percentile of each institution's peer group was adopted by the State in the mid-1980s. For FY 2014, the General Assembly provided an additional $24.3 million to increase faculty salaries by three percent. Still, most institutions are not meeting the State's 60th percentile faculty salary goal (Chapter 2).

Instructional Spending per Student FTE Has Slowed Over the Past Decade As Enrollment Increased

Despite varying levels of State support, inflation-adjusted instructional spending per student has increased at both the research institutions and the master's and baccalaureate institutions over the past 20 years. Most of the increased spending occurred during the first decade of this 20-year period. During the second decade, spending growth slowed at the master's and baccalaureate institutions; average instructional spending per student actually declined at the research institutions (Table 2). This was due to instructional expenditures not keeping up with, or just keeping up with, large increases in student enrollment during the second decade.

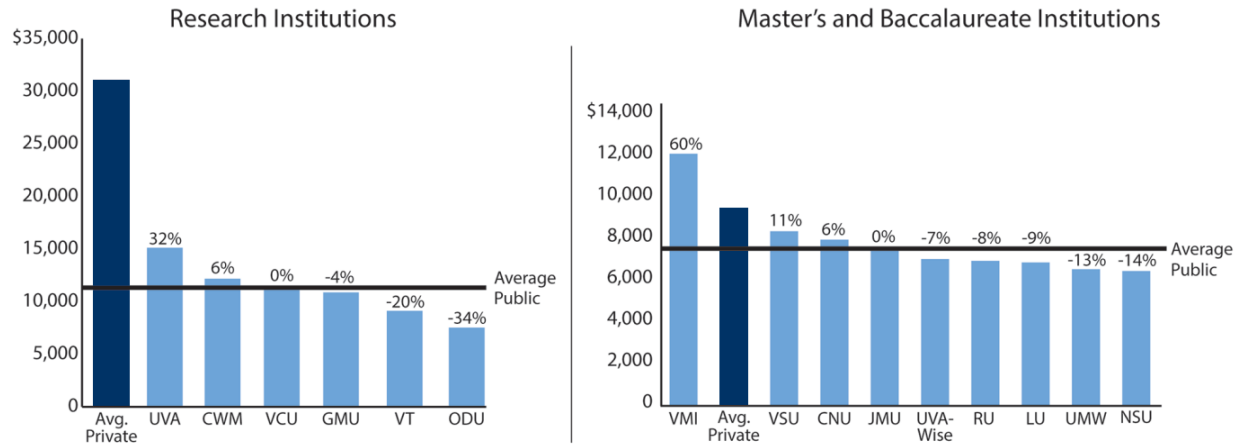
Table 2: Inflation-Adjusted Instructional Spending per Student FTE Has Slowed in Past Decade

Institution type	20 years (FYs 92–11)	First 10 years (FYs 92–01)	Last 11 years (FYs 01–11)
Research			
Avg. % change in instructional spending per student	14.9%	23.4%	–6.9%
% change in student enrollment	37.3	6.8	28.6
Master's & baccalaureate			
Avg. % change in instructional spending per student	30.6	27.1	2.8
% change in student enrollment	24.5	3.0	20.9

Note: Does not include spending on operations and maintenance and depreciation, due to changes in how these areas were categorized between FY 1992 and FY 2011.

Source: JLARC staff analysis of IPEDS data.

Figure 3: Instructional Spending Per FTE Student Is At or Below the National Average for Public Institutions at Most Virginia Institutions (FY 2011)



Note: Percentages indicate difference from national average for public institutions.

Source: JLARC staff analysis of IPEDS data.

Other Than at UVA, VMI, and VSU, Instructional Spending Is Similar to or Below National Averages

Instructional spending per student at most Virginia institutions is near or below the nationwide average for public institutions in their Carnegie Classification (Figure 3). Of the research institutions, only UVA is substantially above the national average for instructional spending. Of the master's and baccalaureate institutions, VMI, VSU, and CNU are above the nationwide average for public institutions. Although instructional spending at VMI is significantly above even the average for private institutions, instructional spending at VMI is not measurably different from spending at similar military educational institutions (not including U.S. military service academies).

Chapter 5 provides an in-depth discussion of the reasons why instructional spending differs by institution. Institutional mission, such as the level of research conducted and graduate education provided and the types of academic disciplines offered are the primary factors affecting instructional costs. Also, some institutions, like VMI, strive to offer small class sizes and low student-faculty ratios, which leads to higher spending per student.

RESEARCH SPENDING HAS INCREASED RECENTLY BUT PER CAPITA SPENDING IS WELL BELOW NATIONAL AVERAGE

The majority of academic research spending (98 percent) at Virginia's public higher education institutions occurs at the six research

institutions. These institutions spent over $1 billion on research in FY 2011. The majority of research funding comes from federal sources, although the State provides some support for research as well. As with spending on instruction, Virginia's institutions are near or below national averages for spending on research.

State Has Multiple Research Funding Programs That Have Changed Over Time

In addition to providing general funds to support instruction, the State provides funds for academic research. As indicated in a 2012 SCHEV policy briefing, State funding for research has been somewhat "erratic" over time. State support peaked in FY 2007 and FY 2008 when over $30 million annually was provided through the Commonwealth Research Initiative (CRI) for operating and capital expenses related to research, including facility and space construction, laboratory equipment, and capacity enhancements to academic departments. Other State initiatives to support research over the past decade included:

- Commonwealth Technology Research Fund ($26.8 million in awards between FY 2001 and FY 2011);
- Seed Money Initiative ($8.3 million in FY 2006);
- Higher Education Research Initiative ($300,000 to $6.6 million annually between FY 2007 and FY 2011);
- Select research projects identified at specific institutions ($12 million to $25 million annually between FY 2009 and FY 2014); and
- Higher Education Equipment Trust Fund ($6.0 million to $33 million annually).

Virginia currently has three primary means of supporting academic research: (1) direct appropriations for select research projects, (2) the Higher Education Equipment Trust Fund, and (3) the Commonwealth Research Commercialization Fund (CRCF).

Some Institutions Receive Direct General Fund Appropriations for Selected Research Projects. In FY 2014, $25.4 million will be provided for specific research projects. Projects that have received funding specifically identified in the Appropriation Act include:

- Biomedical research and biomaterials engineering at CWM and GMU;
- Multidisciplinary modeling and simulation at ODU;
- Bioengineering, biosciences, and cancer research at UVA;
- Biomedical engineering, regenerative medicine, and cancer research at VCU; and
- Bioengineering, biomaterials, and nanotechnology at VT.

In the 2012-2014 biennium, focused ultrasound surgery and an economic development accelerator at UVA, Parkinson's and movement disorder research at VCU, and brain disorder research at VT were added to the list of research endeavors receiving direct State funding.

In addition to the funding for research projects identified within institutions' budgets, general funds have been provided through the Secretary of Commerce to support higher education research since FY 2011. In FY 2014, $2.5 million was provided for the bio-sciences research consortium of UVA, VCU, VT, GMU, and Eastern Virginia Medical School. Also, $10.4 million was provided in support of aerospace engine manufacturing. Among other things, these funds can be used for chaired professorships, research, and graduate student endowments.

The Higher Education Equipment Trust Fund Has Been a Consistent Source of State Support for Instruction and Research. The Higher Education Equipment Trust Fund (HEETF) was established in 1986 to provide funding for equipment upgrades and replacement in the areas of instruction and research. Over the past decade, HEETF has provided an average of $51 million annually for higher education equipment purchases. In FY 2007, a research component was added to HEETF. Since FY 2011, HEETF amounts have included from $6 million to $12 million annually specifically for research-related equipment upgrades and replacement. Several Virginia institutions report that HEETF is one of the most important sources of State support for research.

Commonwealth Research Commercialization Fund Supports Later Stage Research and Development Efforts. The Commonwealth Research Commercialization Fund (CRCF), administered by the Center for Innovative Technology, advances science- and technology-based research, development, and commercialization, with the goal of driving economic growth in Virginia. The CRCF replaced the Commonwealth Research Technology Fund in FY 2012. CRCF funds are available to the private sector, political subdivisions, and higher education institutions. Higher education institutions were awarded approximately $2 million in CRCF funds in each of FY 2012 and FY 2013.

Research Spending at Virginia's Institutions Has Grown in Past Decade

Despite changing levels of State support for research, total research spending at Virginia's six research institutions increased by 62 percent between FY 2003 and FY 2011. By FY 2011, Virginia's research institutions spent $1.2 billion on research, with VT spending by far the most (Table 3).

Table 3: Virginia Research Institutions Spent Over $1 Billion on Academic Research in FY 2011 ($ Millions)

Institution	Total research expenditures[a]
VT	$450.1
UVA	292.1
VCU	207.8
ODU	102.2
GMU	88.1
Total	1,199.1

[a] Does not include departmental research, which is not separately budgeted for by institutions.
[b] Includes the Virginia Institute for Marine Sciences.

Note: Shows research spending from all funding sources, including federal, private, State and local, and institutional.

Source: JLARC staff analysis of National Science Foundation data.

Research Spending at VT

The level of research spending at VT is considerably higher than at other research institutions. This, in part, reflects its status as a land-grant university. VT receives large amounts of state funding for research compared to other Virginia institutions to carry out its land-grant mission of conducting agricultural research to benefit the Commonwealth.

Virginia's Research Institutions Spend Considerably Less per Capita Than National Average on Research

Although there have been large increases in academic research spending in Virginia, the overall level of research spending is not high when the size of the State is considered. Virginia ranked 16th among states in total academic research and development in FY 2011, whereas Virginia ranked 37th in academic research expenditures on a per capita basis. Research expenditures per capita in Virginia were comparable to the average among southeastern states in FY 2011 and substantially below the national average (Table 4).

Although the overall level of research spending in Virginia is not high relative to other states, Virginia institutions do appear to be well supported by State and local governments. The National Science Foundation provides data on academic research expenditures from state and local sources, but state sources are not reported separately, so it is difficult to determine how state funding in Virginia compares to funding provided by other states. However, it is

Table 4: Research Spending per Capita Is Below National Average and Comparable to Average in Southeast (FY 2011)

	Total per capita expenditures
Virginia	$159
Southeast average	152
U.S. average	207

Note: States included in Southeast regional comparisons are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia. Includes public and private institutions.

Source: JLARC analysis of National Science Foundation and U.S. Census Bureau Data.

Table 5: Virginia's per Capita State and Local Support for Research Is Higher Than Regional and U.S. Averages (2011)

	Per capita state & local expenditures
Virginia	$15.89
Southeast average	12.13
U.S. average	12.24

Note: States included in Southeast regional comparison are Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Tennessee, Virginia, and West Virginia. Includes public and private institutions.

Source: JLARC analysis of National Science Foundation and U.S. Census Bureau data.

evident that funding of higher education research by State and local sources combined is higher in Virginia than in the Southeast and across the U.S. (Table 5).

ACADEMIC SPENDING REPORT IS THIRD IN JLARC SERIES ON HIGHER EDUCATION

The mandate for this study calls for evaluating a broad range of issues related to cost and efficiency at Virginia's public institutions of higher education (Appendix A). All the issues cited in the resolution will be addressed over the series of five reports. A report on long-term trends in higher education was released in June 2013, and a report on auxiliary enterprises was released in September 2013. This report on research and instructional spending and workload is third in the series. The fourth report, to be published in 2014, will cover administrative services, information technology, and procurement.

The fifth and final report in the series, scheduled for release in 2014, will address the major concerns identified in four previous reports along with some other major factors that affect student costs. That report will include options and recommendations, developed over the entire series, for improving efficiency and managing costs. Those recommendations may be for actions by individual institutions or system-wide changes by the General Assembly.

Chapter 2 Enrollment Growth is Primary Driver of Rising Faculty Costs

In Summary

Virginia's public four-year higher education institutions spent $1.4 billion on faculty salaries and benefits in FY 2012. This represents the largest instructional expenditure for institutions. Increases in faculty compensation expenditures were largely driven by growth in faculty FTE to keep pace with student enrollment growth and maintain consistent faculty workloads. Approximately three-fourths of increased faculty spending at Virginia's public four-year institutions was due to enrollment-driven growth. Some Virginia institutions have increased their reliance on relatively low-cost contingent faculty since FY 2005, although overall use of contingent faculty is lower in Virginia than nationwide. Virginia's public four-year institutions have collectively attained the State's 60th percentile goal for faculty salaries only three times during the past 24 years, and only one institution met the 60th percentile in FY 2012. Several recommended changes would improve the accuracy of the faculty salary benchmarking process.

Faculty compensation constitutes the largest portion of instructional expenditures. A common perception has been that rising faculty salaries at least partially explain rising tuition rates. Several factors contribute to increased institutional expenditures on faculty. They include faculty salary and benefit levels, tenure status, enrollment growth, and policies relating to faculty workload.

As noted in JLARC's 2013 report, *Trends in Higher Education Funding, Enrollment, and Student Costs*, student enrollment at Virginia's 15 public four-year higher education institutions has increased more than the national average. Enrollment growth appears to be the largest driver of increased spending on faculty compensation as Virginia institutions hire additional teaching and research (T&R) faculty. Statewide, student enrollment increased 23 percent over the past decade, with growth rates ranging from two percent at RU to 45 percent at VCU.

Base Year of Analysis

FY 2005 is the base year for much of the analysis in this report. FY 2005 was chosen because it was the earliest year for which data could be consistently provided by the majority of Virginia institutions.

Popular views that rising average salaries and benefits are influencing increased spending do not appear to hold true among most Virginia institutions. Some institutions were able to slow expenditure growth through an increased use of contingent faculty and lower average salaries between FY 2005 and FY 2012 (adjusted for inflation), due to the State salary freeze.

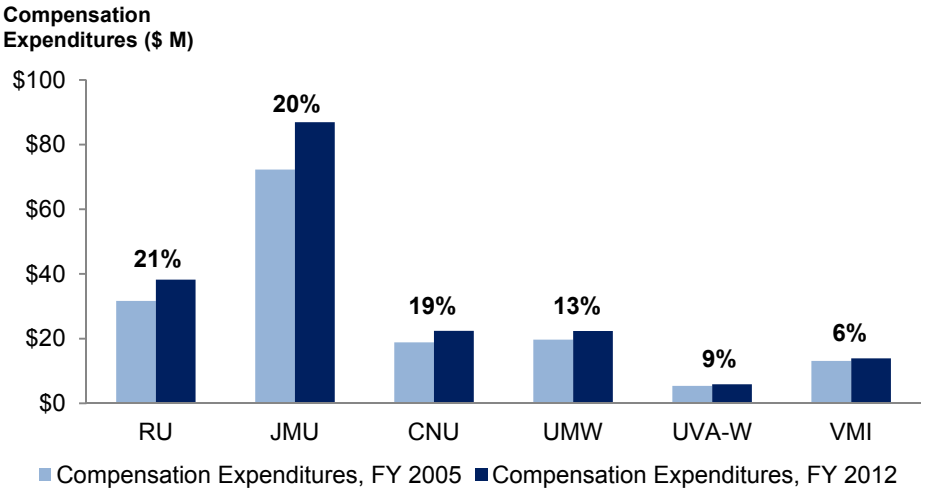
INSTITUTIONAL SPENDING ON FACULTY INCREASED PRIMARILY TO KEEP PACE WITH ENROLLMENT GROWTH

Virginia's public four-year institutions spent $1.4 billion on faculty salaries and benefits in FY 2012. Among institutions reporting complete compensation expenditures in both FY 2005 and FY 2012, spending increased by 17 percent, or $145.7 million (in constant 2011 dollars).

Increased Faculty Expenditures at Master's and Baccalaureate Institutions Were Primarily Driven by Additional Hiring

Faculty compensation expenditures at Virginia's master's and baccalaureate institutions increased 15 percent between FY 2005 and FY 2012. This represents an aggregate $28.7 million increase, from $161.0 million to $189.7 million (in constant 2011 dollars). Spending increases ranged from 21 percent at RU to six percent at VMI (Figure 4).

Figure 4: Increases in Compensation Spending Varied Widely Among Master's and Baccalaureate Institutions (FY 2005–FY 2012)



Note: Expenditures are in constant 2011 dollars. LU, NSU, and VSU are excluded, as they were unable to provide complete compensation expenditures for FY 2005. Includes T&R faculty.

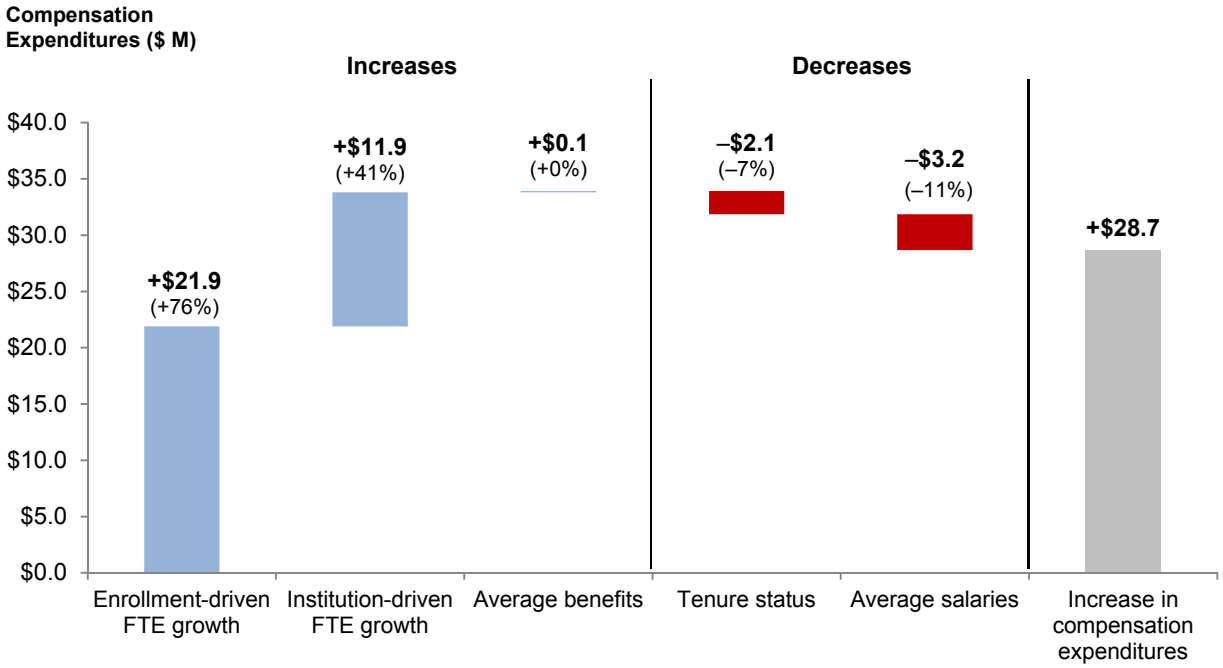
Source: JLARC staff analysis of institutionally reported data.

Teaching & Research (T&R) Faculty

T&R faculty perform a variety of duties, including teaching, research, and service. The majority of their time is typically spent on instruction. These faculty implement the instructional mission of an institution.

Increased faculty compensation expenditures at the master's and baccalaureate institutions were largely driven by the growth in full-time equivalent (FTE) faculty (Figure 5). Aggregate teaching and research (T&R) faculty FTE increased by 23 percent between FY 2005 and FY 2012. At the same time, these institutions experienced aggregate enrollment growth of 14 percent. Institutional efforts to maintain consistent faculty workloads between FY 2005 and

Figure 5: Increase in Faculty FTEs Accounted for Majority of Increased Compensation Spending at Master's and Baccalaureate Institutions (FY 2005–FY 2012)



Note: Data shown are for T&R faculty at CNU, JMU, RU, UMW, UVA-W, and VMI combined. LU, NSU, and VSU were unable to provide complete compensation expenditures for FY 2005 and are excluded. Enrollment growth measured by student credit hours. Numbers may not add due to rounding. Expenditures are in constant 2011 dollars.

Source: JLARC staff analysis of institutionally reported data and SCH data provided by SCHEV.

FY 2012 accounted for most of the additional T&R faculty hired during this period and contributed to $21.9 million in increased compensation expenditures.

Not all growth in faculty FTE can be attributed to enrollment growth. Some institutions, such as CNU, added faculty to decrease their student to full-time faculty ratio or to reduce instructional workloads (Chapter 3). Institutional policies that increased the number of T&R faculty beyond the number needed to compensate for enrollment growth by maintaining consistent faculty workloads accounted for $11.9 million in increased compensation expenditures.

Declining average salaries (in constant 2011 dollars) slowed the increase in faculty expenditures during the eight-year period between FY 2005 and FY 2012. Expenditures on salaries for existing faculty decreased by $3.2 million during this period due to declining average salaries. This is partially explained by the State's salary freeze for all State employees, including faculty, between FY 2008 and FY 2013.

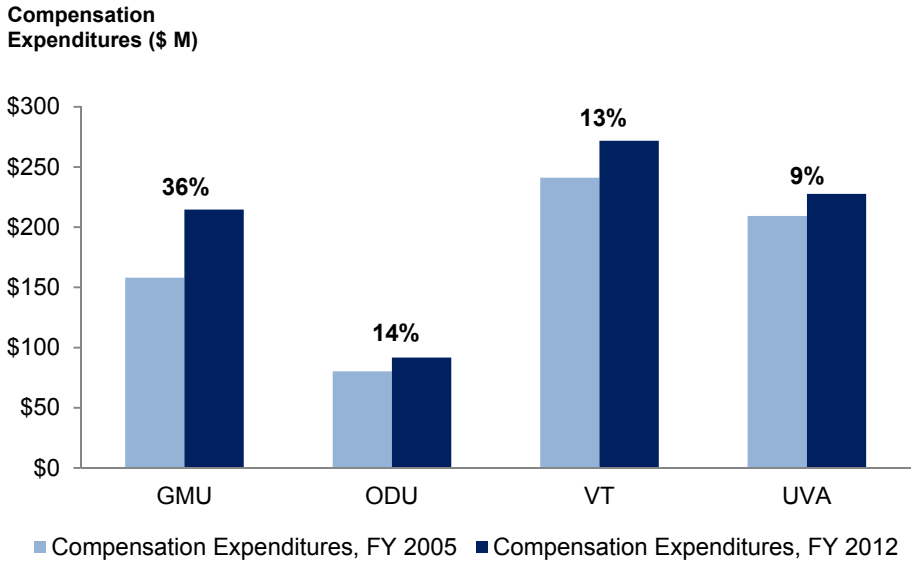
RU was the only institution in the master's or baccalaureate category where rising average salaries contributed to increased spending between FY 2005 and FY 2012. University staff commented that increased spending addressed salary inequities, salary inversion, and a higher 60th percentile goal. Staff noted that the General Assembly's 10 percent authorized salary increase in 2007 for nursing professors and the authorized five percent salary increase in 2011 for faculty who participate in the Virginia Retirement System's Plan 1 were additional contributing factors.

Increased Faculty Expenditures at Research Institutions Are Due to Additional Hiring and Rising Average Salaries

Faculty compensation expenditures at Virginia's research institutions increased at a slightly faster rate than at master's and baccalaureate institutions, 17 percent, between FY 2005 and FY 2012. This represents an aggregate $116.5 million increase, from $688.7 million to $805.2 million (in constant 2011 dollars). Spending increases ranged from 36 percent at GMU to nine percent at UVA (Figure 6).

As with the master's and baccalaureate institutions, the majority of increased spending at research institutions can be attributed to an

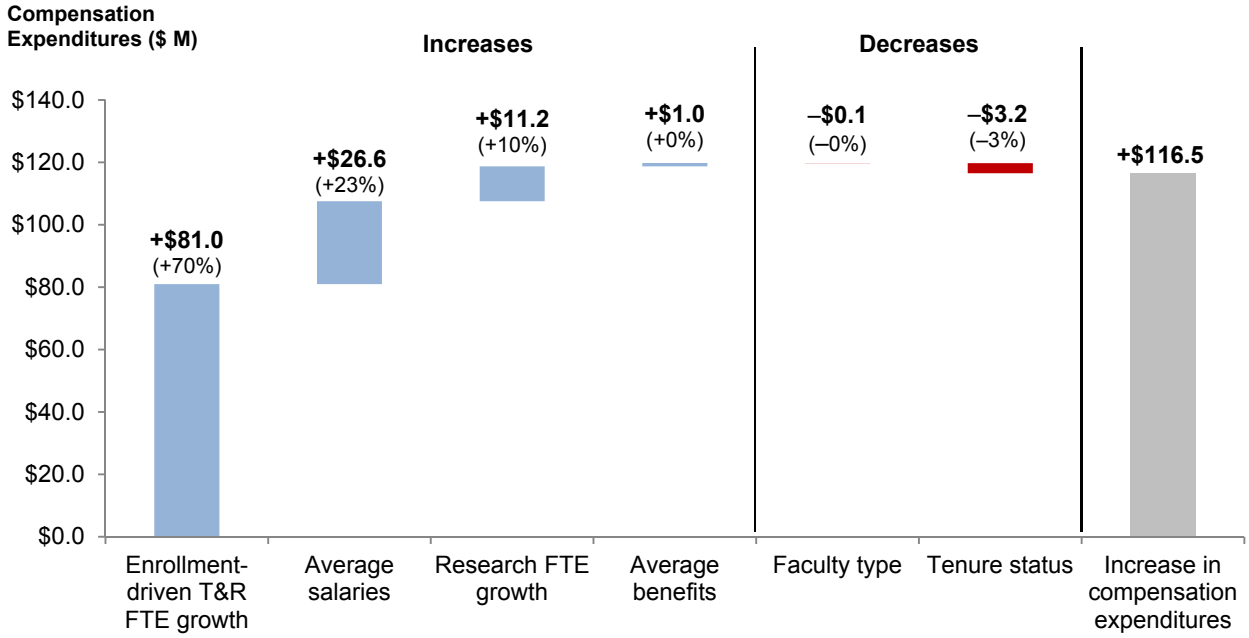
Figure 6: Increases in Compensation Spending Varied Widely Among Research Institutions (FY 2005–FY 2012)



Note: Expenditures are in constant 2011 dollars. CWM and VCU are excluded, as they were unable to provide complete compensation expenditures for FY 2005. Includes T&R and research faculty.

Source: JLARC staff analysis of institutionally reported data.

Figure 7: Increase in Faculty FTEs Due to Enrollment Growth Accounted for Majority of Increased Compensation Spending at Research Institutions (FY 2005–FY 2012)



Note: Data shown are for T&R and research faculty at GMU, ODU, UVA, and VT combined. CWM and VCU were unable to provide complete compensation expenditures for FY 2005 and are excluded. Part-time benefit expenditures at VT are excluded, as VT was unable to provide FTE for recipients. Numbers may not add due to rounding. Enrollment growth measured by student credit hours. Expenditures are in constant 2011 dollars.

Source: JLARC staff analysis of institutionally reported data and SCH data provided by SCHEV.

increase in faculty FTE to address rising student enrollment (Figure 7). Institutional efforts to maintain consistent faculty workloads between FY 2005 and FY 2012 accounted for T&R faculty hired during this period and contributed to $81.0 million in increased compensation expenditures.

However, Virginia's research institutions did not entirely keep pace with enrollment growth. During this period, student enrollment at the research institutions collectively increased 16 percent, while T&R faculty FTE increased by 13 percent. A moderate increase in workload for contingent faculty, in addition to other factors, likely allowed research institutions to increase the size of their faculty at a rate slower than enrollment growth. (See Chapter 3 for additional information.)

Increased faculty salaries and growth in research activity also increased compensation expenditures. In contrast to average salaries at the master's and baccalaureate institutions, rising average salaries at the research institutions contributed to $26.6 million in increased compensation spending. Institutional initiatives, such as GMU's effort to increase faculty salaries, provide a partial explana-

tion for the aggregate increase at these institutions. Growth in research faculty also contributed $11.2 million in increased spending.

There was some variation in expenditure trends at individual research institutions. At ODU, average salaries declined between FY 2005 and FY 2012. University staff noted that this was due in part to a lack of base funds. This mitigated some of the costs associated with increasing the size of the faculty body. Further, declining average salaries at VCU between FY 2008 and FY 2012 (not included in Figure 7) offset almost the entire cost of compensation for additional faculty and higher costs associated with a reduction in the proportion of supplemental faculty.

SOME VIRGINIA SCHOOLS RELY INCREASINGLY ON LOWER-COST CONTINGENT FACULTY, BUT NOT AS MUCH AS INSTITUTIONS NATIONWIDE

Faculty Types

This report refers to three types of faculty:

Tenured and tenure-track faculty

Contingent faculty

This category includes both non-tenure-track faculty, who are ineligible for tenure but receive a contract that may be renewed, and supplemental faculty, who are temporary hires and receive a one-time appointment. The category of supplemental faculty most commonly refers to adjunct faculty.

Student teaching assistants

In certain academic disciplines, institutions have historically made use of supplemental faculty with professional experience and specialized knowledge. Since the 1970s, institutions nationwide have been shifting toward greater use of contingent faculty to alleviate budgetary pressures and adapt to enrollment growth and changing faculty workloads.

Virginia Schools Rely Less on Contingent Faculty Than Institutions Nationwide, But Some Have Increased Reliance

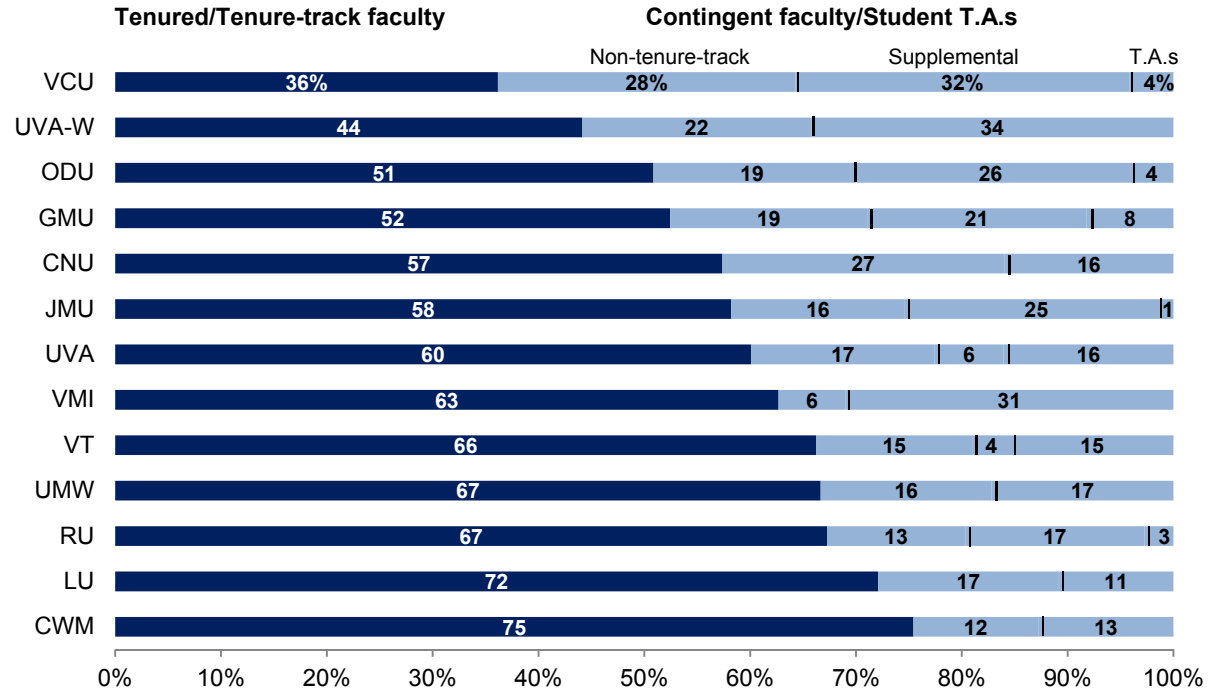
In FY 2012, tenured and tenure-track faculty amounted to 55 percent of total T&R faculty at Virginia's research institutions, while 36 percent were contingent faculty and nine percent were student teaching assistants. Virginia's master's and baccalaureate institutions relied more on tenured and tenure-track faculty (62 percent of total T&R faculty) and less on contingent faculty (38 percent) and student teaching assistants (one percent).

Individual institutions varied in their use of tenured and tenure-track faculty, contingent faculty, and student teaching assistants in FY 2012 (Figure 8). Contingent faculty and student teaching assistants constituted 64 percent of T&R faculty and student teaching assistant FTE at VCU but only 28 percent at LU. In addition to institutional guidelines regarding the use of contingent faculty (Chapter 3), institutional accreditation affects the use of contingent faculty by requiring an adequate number of full-time faculty to support an institution's mission.

Contingent faculty constituted 56 percent of T&R faculty nationwide in FY 2010, compared to 37 percent statewide in FY 2012.

In Virginia, contingent faculty make up a lower percentage of T&R faculty than the national average. Across all degree-granting institutions nationwide, contingent faculty comprised 56 percent of T&R faculty in FY 2010 compared to 37 percent statewide in Virginia in

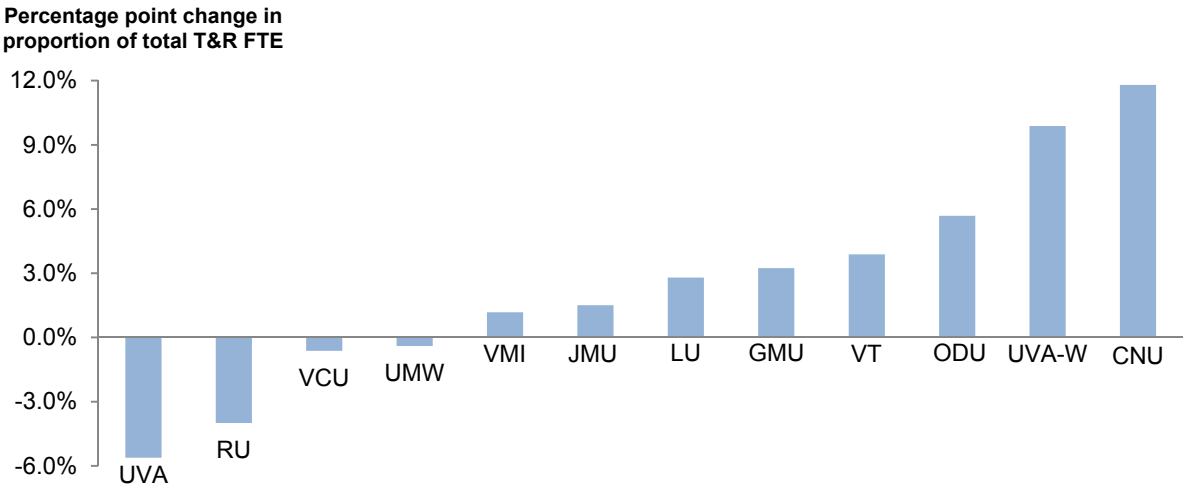
Figure 8: Contingent Faculty Account for Majority of T&R Faculty FTE at VCU and UVA-W (FY 2012)



Note: Not all institutions employ student teaching assistants. VSU and NSU were unable to provide complete FTE for FY 2012 and are excluded. CWM did not report student teaching assistant FTE; reported FTE include VIMS faculty. Numbers may not add due to rounding.

Source: JLARC staff analysis of institutionally reported data.

Figure 9: Eight Institutions Increased Proportion of Contingent Faculty and Student Teaching Assistants (FY 2005–FY 2012)



Note: LU and VCU data are for FY 2008–FY 2012. CWM, NSU, and VSU were unable to provide complete faculty FTE for FY 2005 and are excluded.

Source: JLARC staff analysis of institutionally reported data.

FY 2012. The statewide proportion of contingent faculty remained relatively consistent between FY 2005 and FY 2012, increasing slightly from 35 to 37 percent.

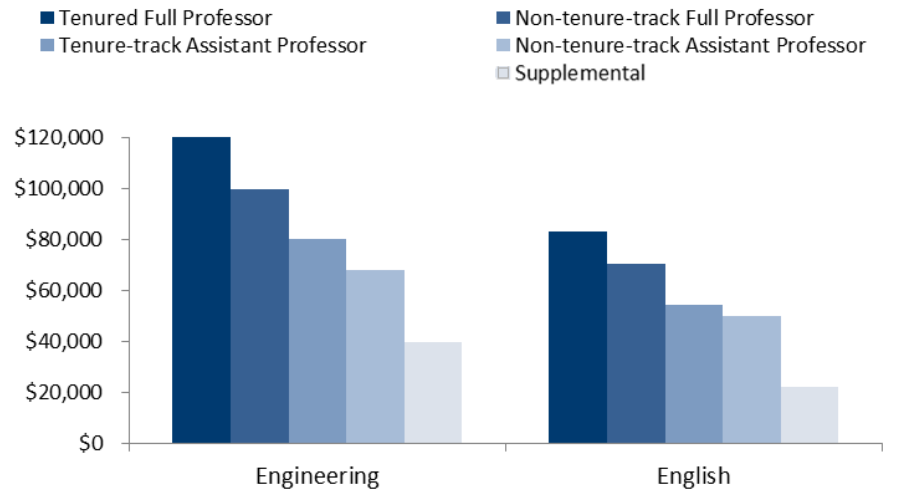
Although most Virginia institutions increased their number of contingent faculty FTE between FY 2005 and FY 2012 as part of overall growth in faculty FTE, eight institutions also increased contingent faculty and student teaching assistant FTE as a proportion of total T&R faculty (Figure 9). CNU and UVA-W increased their use of contingent faculty and student teaching assistants by the largest proportions, while UVA and RU decreased their proportions.

Increased Use of Contingent Faculty Reduces Costs

Tenured and tenure-track faculty typically receive higher salaries than contingent faculty. For example, a full-time non-tenure-track English professor at a four-year institution nationwide earns about 15 percent less in salary than a tenured or tenure-track English professor (Figure 10).

Comparable discrepancies are found among assistant professors in English, as well in other disciplines, such as engineering. Supplemental faculty teaching a four-course load per semester may earn 40 to 67 percent less than tenured, tenure-track, or non-tenure-track faculty. Supplemental faculty also do not typically receive

Figure 10: Contingent Faculty Generally Earn Less Than Tenured and Tenure-Track Faculty (2012-13)



Note: Average wage per three-credit course has been annualized to a 24-credit teaching load for supplemental faculty. Average salaries for full professors and assistant professors are normalized to a 9/10 month contract.

Source: JLARC staff analysis of CUPA-HR, "Faculty in Higher Education Salary Survey For the 2012-13 Academic Year: Executive Summary," and The Chronicle of Higher Education's Almanac of Higher Education 2013, "Highest- and Lowest-Paid Disciplines for Adjuncts, 2012-13."

most fringe benefits, such as health insurance and retirement benefits, that tenured and tenure-track and full-time non-tenure-track faculty receive. The value of these benefits, combined with higher salaries, makes total compensation for full-time faculty substantially higher than compensation for supplemental faculty.

Changes in the proportion of tenured and tenure-track faculty and contingent faculty generally represent a negative driver of faculty compensation expenditures. For example, CNU's shift from tenured and tenure-track faculty to non-tenure-track faculty resulted in $679,000 in reduced costs between FY 2005 and FY 2012. At UVA-W, the shift from tenured and tenure-track faculty to supplemental faculty, primarily adjuncts, offset 47 percent of the cost associated with hiring additional faculty. Conversely, UVA's increased use of tenured and tenure-track faculty represented $8.5 million in additional spending.

To the extent that institutions increasingly rely on lower cost non-tenure-track and supplemental faculty, the trends are likely to continue, as institutions spend the same, or less, per faculty member in order to employ more faculty. Although this strategy accommodates enrollment growth while constraining instructional spending, its effects on instructional quality are uncertain. While some national studies have found that students taking courses taught by adjunct faculty are more likely to take subsequent courses in the same subject compared with students who were taught by full-time faculty, other studies have found a negative impact on retention and graduation rates.

REWARDS FOR RESEARCH AND DISCIPLINARY SALARY DIFFERENTIALS INFLUENCE FACULTY EXPENDITURES

In addition to student enrollment growth and the use of contingent faculty, other factors influence institutional spending on faculty compensation. In particular, the national labor market for faculty provides greater financial rewards for research and results in salary differentials across disciplines.

Research literature examining the relationship between faculty workloads and compensation has found a greater reward for research than instruction since the 1970s. These studies have found that salaries are generally lower among faculty who focus more on instruction, while faculty who spend a greater proportion of time on research, direct research projects, or have higher research productivity, generally have higher average salaries.

JLARC staff conducted a survey of faculty to gain their perspectives on a number of issues related to workload and compensation (sidebar). Salary and workload data obtained through this survey

show that T&R faculty in Virginia who are involved with research are better compensated as a group. Faculty commonly expressed a perception that research resulted in greater financial rewards and recognition than teaching, both in the national market and at their institutions, through tenure and promotion standards, other institutional expectations, and salary structures. As indicated by two T&R faculty at research institutions:

> "At present, excellent teachers can receive one-time rewards at my university, but there are otherwise strong disincentives to prioritize improving access to and quality of courses (or graduate advising) over peer-reviewed research publications."
>
> ***
>
> "Right now, there is NO incentive (other than one's own conscience) to be a good teacher…. If your career advancement is almost wholly dependent on your scholarship and there's no true accountability for poor teaching, why on earth would anyone prioritize good teaching?"

JLARC Staff Survey of Virginia Faculty at Public Four-Year Institutions

The survey of T&R and research faculty was distributed by each of Virginia's 15 public four-year institutions, to more than 11,100 faculty. A total of 4,605 faculty responded to the survey. Additional information about JLARC staff's survey of faculty can be found in Appendix B.

The proportion of T&R faculty engaged in research activities, and who typically earn higher salaries, increased at Virginia's research institutions between FY 2005 and FY 2012. Several Virginia institutions have increased their numbers of graduate programs over the past eight years. National studies have shown that faculty who teach only graduate students generally earn higher salaries than faculty who teach only undergraduate students or faculty who teach both student levels. Virginia appears to follow national trends, based on salary data reported by Virginia faculty on the JLARC staff survey. (Chapter 3 provides more detail on faculty workload and the different incentives to spend time on instruction or research.)

STEM-H Disciplines

Science – includes physical and biological sciences.

Technology – includes computer science.

Engineering

Mathematics

Health – includes medicine, nursing, and pharmacy.

Faculty in Science, Technology, Engineering, Mathematics, and Health and Other Growing Disciplines Command Higher Salaries

Most institutions have increased their Science, Technology, Engineering, Mathematics, and Health (STEM-H) offerings in response to the Higher Education Opportunity Act, student demand, and projected employment growth. As a result, institutions have hired additional T&R faculty to account for growing enrollments in STEM-H disciplines. Statewide, the largest growth in T&R faculty FTE was in computer science and health.

Table 6: Faculty in STEM-H and Professional Fields Generally Earn Higher Average Salaries Than Faculty in Humanities and Social Sciences (2011-12)

Academic discipline	Field	Average salary full professor
Law & legal professions	Professional	$135,187
Engineering	STEM-H	117,911
Business	Professional	114,847
Computer & information sciences	STEM-H	103,536
Health professions	STEM-H	98,415
Biological & biomedical sciences	STEM-H	95,118
Social sciences	Social Sciences	91,350
Physical sciences	STEM-H	90,937
Foreign languages	Humanities	87,104
Mathematics & statistics	STEM-H	86,744
Psychology	Social Sciences	86,117
Education	Professional	85,165
English	Humanities	81,537
Visual & performing arts	Humanities	81,257

Notes: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty members at public and private four-year institutions reporting data to CUPA-HR and are normalized to a 9/10 month contract. Selected disciplines shown in table; see source for full list of disciplines.

Source: College and University Professional Association for Human Resources (CUPA-HR), "2011-12 National Faculty Salary Survey Executive Summary."

Academic Discipline

In this report, the term "academic discipline" refers to a broad field of study and follows the National Center for Education Statistics (NCES) classification codes.

For example, NCES recognizes **social sciences** as an academic discipline, with sub-disciplines that include **political science**, **economics**, and **geography**.

Institutions generally pay higher salaries to faculty in STEM-H disciplines due to the availability of high paying jobs in non-academic sectors (Table 6), which increases total compensation costs. Faculty in these disciplines also generally have increased opportunities to conduct externally-funded research, which has a higher funding potential than internally-funded research or externally-funded research in the humanities or social sciences.

Statewide, the largest growth in total salary expenditures between FY 2005 and FY 2012 was in health and the biological and biomedical sciences. Institutions were generally able to mitigate the higher cost of STEM-H faculty salaries through increased use of contingent faculty, particularly supplemental faculty. (Chapter 5 provides more detail on the effect of institutional mission and program offerings on instructional costs.)

Some Virginia Institutions Rely Less on State General Funds to Compensate Faculty

State general funds have declined when measured on a per student, inflation-adjusted basis. (See JLARC's 2013 report, *Trends in Higher Education Funding, Enrollment, and Student Costs*.) Vir-

ginia's research institutions generally have more access to funding through research grants and donations and endowments and therefore do not rely as heavily on the State for funding. For example, the six research institutions relied, on average, on general funds and tuition and fee revenue for 78 percent of faculty salaries in FY 2012. Reliance on general funds and tuition and fees varies, ranging from 62 percent of UVA's salary expenditures to nearly 100 percent of ODU's.

In contrast, most master's and baccalaureate institutions relied on these same funding sources to pay for nearly all faculty salary expenditures. VMI was one exception, as it was able to fund 14 percent of salary expenditures through its endowment and private donations. This is comparable to UVA's use of endowment funds. Differing access to private funding sources may explain, in part, why some institutions were able to increase average salaries despite the State salary freeze, while others experienced declining average salaries (in constant 2011 dollars).

FACULTY SALARIES ARE BELOW STATE POLICY GOAL, AND PROCESS TO FUND FACULTY SALARIES COULD BE IMPROVED

Faculty salaries have not been the primary driver of instructional costs at Virginia's institutions of higher education. On the whole, faculty at Virginia institutions do not appear to be overcompensated relative to faculty at peer institutions and institutions in the same Carnegie classifications. Therefore, faculty salaries do not appear to be an area in which institutions can become significantly more cost efficient.

Virginia Peer Groups

Peer institutions share similar characteristics with the Virginia institution against which they are being compared.

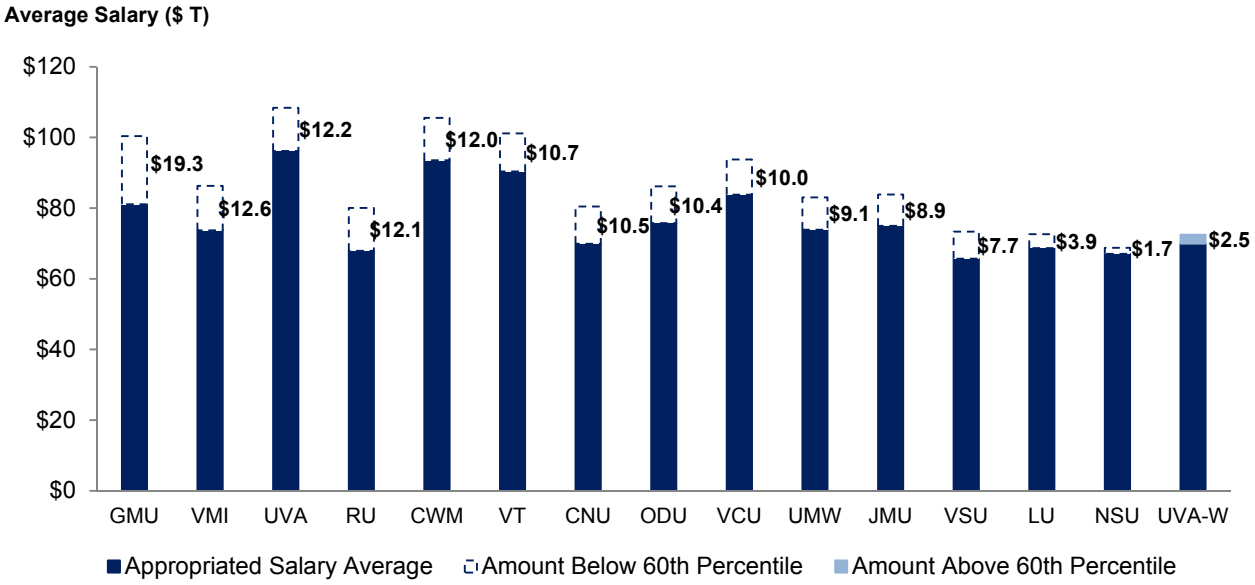
SCHEV staff collect data on institutional characteristics, such as student enrollment, percentage of degrees awarded by degree level, percentage of degrees awarded by field, and graduation rates. Peer groups are selected for Virginia institutions through quantitative modeling and negotiations with State stakeholders.

Average Institution-wide T&R Faculty Salaries Are Substantially Below State's 60th Percentile Goal

SCHEV uses peer institutions to evaluate the competitiveness of T&R faculty salaries at Virginia's public four-year institutions. On average, Virginia's 15 institutions paid faculty salaries at the 31st percentile of their peer group in FY 2012. Five institutions (JMU, VSU, LU, NSU, and UVA-W) were ranked above the system-wide average of the 31st percentile, and only UVA-W exceeded the 60th percentile. Institutions ranged from $19,328 below the 60th percentile at GMU to $2,510 over the 60th percentile at UVA-W (Figure 11). Institutions have collectively attained the 60th percentile three times since 1988.

The State and institutions would need to provide approximately $95.8 million to attain the 60th percentile system-wide (as of FY 2012), with the largest need at GMU, VT, UVA, and VCU, due to their large number of T&R faculty and large gap between appropriated average salaries and the 60th percentile of their peers.

Figure 11: Fourteen Institutions Fell Below the 60th Percentile of Their Peers, Nine by $10,000 or More (2011-12)



Note: Average salaries are normalized to a 9/10 month contract. Excludes medical faculty. GMU's appropriated average salary does not include the 8.57% salary adjustment for Northern Virginia's high cost of living; State policy excludes it from peer comparisons.

Source: JLARC staff analysis of SCHEV data on peer group percentiles.

JLARC staff also assessed the competitiveness of faculty salaries nationwide. This was based on comparisons of actual average salaries at Virginia institutions with actual average salaries for all institutions in their Carnegie group. This does not include adjustments to Virginia salaries that are made for the peer group comparisons (to be discussed later). Nine Virginia institutions had salaries below the 60th percentile of their Carnegie group and seven of these had average salaries below the Carnegie average. Six institutions were above the 60th percentile for their Carnegie group. Institutions ranged from $31,100 below the Carnegie average at VCU to $7,700 above at GMU, although this analysis does not account for cost-of-living differentials.

CUPA-HR and OSU Salary Surveys

The 813 participating institutions of CUPA-HR's salary survey did not commonly include many State-designated peers of Virginia's research institutions. OSU's salary survey represents a sample of selected public research and land-grant institutions, many of whom do not participate in the CUPA-HR salary survey. Between 60 and 80 percent of GMU, ODU, UVA, VCU, and VT peer institutions were included in OSU's survey.

Discipline-Specific Faculty Salaries Tend to Be Below Salaries at Other Institutions in Same Carnegie Classification

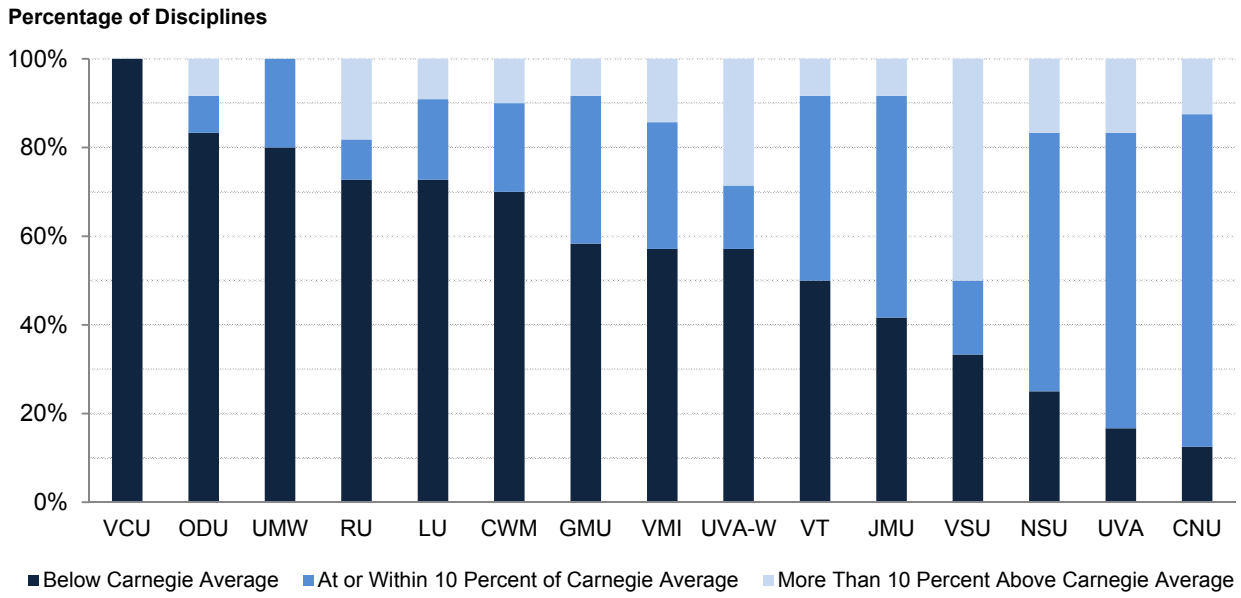
Compensation experts and institutional staff indicate the importance of examining faculty salaries at the discipline level, because there may be wide differences in average salaries among disciplines.

JLARC staff compared salaries at Virginia's institutions in 12 academic disciplines to national benchmarks using CUPA-HR and OSU salary survey data (sidebar). Average salaries in selected dis-

ciplines fall below national benchmarks at many institutions. At six Virginia institutions (VCU, ODU, UMW, RU, LU, and CWM), at least 70 percent of disciplines had average assistant professor salaries below the Carnegie average salary (Figure 12). Similar trends were found for associate and full professors.

At Virginia institutions, STEM-H disciplines generally tend to have more competitive average salaries than non-STEM-H disciplines. While this is particularly true among STEM-H disciplines at master's and baccalaureate institutions, there is one exception. A majority (70 percent) of STEM-H disciplines at research institutions had associate professor average salaries below the Carnegie average. Not all STEM-H or non-STEM-H disciplines are equally competitive. Average salaries in engineering, computer science, and health are generally more competitive at Virginia institutions than average salaries in mathematics and statistics and the biological and biomedical sciences. English and the social sciences tend to have less competitive average salaries than business and psychology. (See Appendix C for discipline-level average salary benchmarking for each institution.)

Figure 12: Discipline-Level Average Salaries for Assistant Professors at Most Virginia Institutions Are Near or Below Carnegie Average Salaries (2011-12)



Note: The majority of institutions reported data for 10 to 12 disciplines, while several others did not employ faculty at the assistant professor rank in certain disciplines and reported fewer disciplines (CNU: 8, UVA-W: 7, VMI: seven). VCU reported data for four disciplines and two sub-disciplines. Some institutions were unable to isolate faculty salary expenditures for certain academic disciplines and therefore reported multiple disciplines or sub-disciplines together (e.g., economics with business). See Appendix C for additional details. Carnegie groups: doctoral, master's, and baccalaureate. Average salaries are normalized to a 9/10 month contract.

Source: JLARC staff analysis of CUPA-HR data, 2011-12 (master's and baccalaureate institutions) and OSU data, 2011-12 (research institutions).

Process To Compare Faculty Salaries Should Be Updated and Refined

There are a number of improvements the State should make to the peer group process it uses to compare and fund higher education faculty salaries. The overall approach appears reasonable, as evidenced by the similar results that are found when faculty salaries are compared nationwide and at the discipline level. However, several changes would make salary comparisons more accurate and the process more transparent.

Process Uses Outdated Salary Information. In 1987, the State set each institution's appropriated average salary equal to its actual average salary (the salary level that a school's appropriated operating budget supported) at the time. Appropriated average salaries have been carried forward each year and indexed to reflect salary increases approved by the governor and General Assembly. Salary increases provided solely by institutions are typically not included.

Many institutions now have appropriated average salaries that are higher than their actual average salaries, which results in the average salaries at those institutions appearing closer to the 60th percentile than they actually are. For example, UVA-W ranked at the 73rd percentile of its peer group in FY 2012 based on its appropriated average salary. UVA-W would have been ranked at the 14th percentile of its peer group if its actual average salary was used for benchmarking, though, because the actual average salary at UVA-W was almost $12,000 below its appropriated average.

Process Does Not Include Private Funding Sources. Funds from external sources, such as endowments, are not considered when calculating average appropriated salaries at Virginia institutions. According to the Code of Virginia,

> in measuring the extent to which the Commonwealth shall finance higher education in Virginia, the availability of the endowment funds and unrestricted gifts from private sources of institutions of higher education received by such institutions shall not be taken into consideration in, nor used to reduce, state appropriations or payments. (§ 23-9.2)

National data sources for peer institutions' salaries count all sources of funding, including private funding sources. Some Virginia institutions' peers may have access to substantial private funding. When private funds are not counted, Virginia institutions appear to pay lower average salaries. For example, UVA ranked at the 26th percentile of its peer institutions in 2011-12, with an appropriated average salary of $96,158. The State would have needed

to increase UVA's average salary by approximately $12,000 to meet the 60th percentile of its peers. Accounting for the difference between actual and appropriated average salaries, and including private funding sources, would increase UVA's average salary to $110,871, placing it $2,500 above the 60th percentile.

SCHEV and some institutions express concerns about changing current State policy to allow private funding sources in salary comparisons. They indicate that private donors may view such a change as substituting private funds for public funds, which may compromise private giving.

Regardless of whether private funding is included, re-basing appropriated and actual average salaries would improve the accuracy of salary comparisons and would not substantially change the amount of funding needed for faculty salaries system-wide (Table 7).

Recommendation (1). The General Assembly may wish to consider regularly re-basing appropriated and actual average faculty salaries.

Table 7: At Many Institutions, Appropriated Average Salaries Are Higher Than Actual Average Salaries (2011-12)

Institution	Appropriated average salary	Actual average salary (with private funding)	Difference
UVA-W	$69,968	$58,183	$11,785
VCU	83,794	74,163	9,631
LU	68,679	59,815	8,864
UMW	73,897	66,740	7,157
JMU	74,983	68,736	6,247
CNU	69,914	66,600	3,314
CWM	93,536	90,452	3,084
RU	67,916	65,714	2,202
VT	90,392	89,089	1,303
VSU	65,671	65,509	162
NSU	67,051	67,097	–46
VMI	73,704	73,900	–196
ODU	75,721	76,696	–975
GMU	88,019[a]	92,523	–4,504
UVA	96,158	110,871	–14,713
Average	**$77,294**	**$75,073**	**$2,221**

[a]GMU's appropriated average salary includes an 8.57 percent cost-of-living-adjustment, which is not used in the peer benchmarking process because of State policy excluding it from peer comparisons.

Note: Actual average salaries include private funding as State agencies no longer collect data from Virginia institutions on actual average salaries excluding private funding. Average salaries are normalized to a 9/10 month contract.

Source: JLARC staff analysis of IPEDS data on average salaries and SCHEV data on appropriated average salaries.

Discipline-Level Salary Benchmarking Is More Precise. As described previously, there are significant differences in average salaries among disciplines. Benchmarking average faculty salaries at the discipline level would provide a more precise comparison than the current approach of comparing institution-wide salaries. SCHEV staff have commented that institutions should be responsible for setting funding priorities among their disciplines. However, benchmarking at the discipline level would still allow institutions to direct funding to their priorities, such as UVA's goal of having a top-10 law school and providing high salaries to attract top-tier faculty.

Transparency of Peer Group Process for Salary Benchmarking Could Be Improved. Some State agency staff, as well as institutional staff, raised concerns about the composition of institutions' peer groups, such as the inclusion of aspirational peers. Aspirational peers generally have higher average salaries than current peers, which increases the 60th percentile goal. Institutions differed in their perceived ability to modify their peer groups.

To address concerns over the peer group process, stakeholders could meet prior to the 2017 peer selection to review the current process and determine the need for changes. SCHEV could also improve the transparency of the peer selection process. This may be beneficial for institutional staff, who often undergo turnover between the 10-year peer selection cycle; for legislators; and for other State agencies. Some agencies in other states routinely publish their methodology for selecting peer groups. SCHEV could report the outcomes of its statistical model, as well as the results of negotiations and the rationale for making modifications to the peer groups selected through the model.

Recommendation (2). The State Council of Higher Education for Virginia should benchmark average faculty salaries at the discipline level and improve the transparency of the peer group process by reporting the outcomes of its statistical model, as well as the rationale for making modifications to the peer groups selected through the model.

Chapter 3

Tenured and Tenure-Track Faculty Now Teach Marginally Less and Conduct More Research

In Summary

While institutions expect faculty members to teach students, they also expect them to engage in research and service activities. The way faculty spend their time among these three activities has changed over time. From 1996 to 2013, Virginia faculty report that the average percentage of their total workweek spent teaching decreased modestly from 60 to 53 percent, while the average percentage spent researching increased from 16 to 31 percent. Similarly, average teaching loads in Virginia for tenured and tenure-track faculty have declined marginally in recent years but are not consistently above or below national averages. The average tenured and tenure-track faculty member in Virginia taught four percent fewer student credit hours and one percent fewer course sections in fall 2010 than in 2004. Amid this decline and an increased use of contingent faculty at some institutions, the percentage of total student credit hours taught by tenured and tenure-track faculty at research institutions decreased from 54 percent in 2004 to 47 percent in 2010. While the State may be interested in either maintaining or increasing teaching loads, the impact on costs is unknown and State efforts to increase teaching loads may decrease instructional quality.

The study resolution directed JLARC staff to study faculty teaching loads, productivity, and incentives created by current approaches to faculty compensation. There has been substantial interest among states in increasing faculty teaching loads as a potential way to reduce higher education costs. The research literature has not established a single measure of faculty workload. JLARC staff used two main assessment methods identified in prior higher education studies, interviews with experts, and interviews with staff at Virginia's public higher education institutions. The first method assesses how faculty members allocate their time. The second method assesses the extent to which faculty members provide classroom instruction.

VIRGINIA FACULTY REPORT SPENDING LESS OF EACH WORKWEEK ON TEACHING AND SERVICE AND MORE TIME ON RESEARCH THAN IN PAST

One common method for assessing faculty workloads is to measure the amount of time faculty members allocate to various activities. This method does not assess how efficiently faculty members use their time, but it provides a simple overview of the extent to which faculty members may prioritize each activity.

Institutions Expect Faculty to Engage in Teaching, Research, and Service Activities, and Set Workload Policies Largely Based on Those of Similar Institutions Nationwide

Institutions generally expect faculty members to engage in teaching, research, and service activities. Teaching activities include classroom instruction and activities outside the classroom such as course preparation, grading student coursework, and advising and supervising students. Research activities include departmental research funded by the institution, sponsored research funded by external grants, publication of findings, and creative expression. Service activities include service to (i) the institution, such as serving as department chair; (ii) the community, such as serving as an expert; and (iii) the profession, such as serving on a peer-reviewed journal.

Accreditation

Accreditation is a peer-review process through which higher education institutions and programs are certified as meeting established academic and administrative standards of quality. Virginia's public institutions are not required to be accredited, but they seek accreditation for several reasons including assuring quality to stakeholders, meeting state requirements for licensure in certain professions, and complying with federal and state requirements for student financial aid eligibility.

Institutions typically have policies that establish a standard number of courses faculty are expected to teach, based primarily on the workload policies of similar institutions. Since institutions compete for faculty in a national market, staff at several Virginia institutions said that their workload policies are designed to be similar to, and competitive with, those of institutions with similar missions. Institutions also ensure that their workload policies meet a typical accreditation standard, which requires that they have an adequate number of full-time faculty to support the institution's mission.

Most institutions also allow individual departments to establish their own course load expectations because accreditation requirements and types of instruction vary by department. For instance, accreditation requirements for nursing programs specify a maximum number of students per faculty member to ensure instructional quality through small class sizes. A music department may make more use of individualized instruction than other departments. Course load expectations are typically set at the discretion of the department chair or dean in consultation with individual faculty members.

Course Level

The level of a course corresponds to when a student would take the course during their academic career. Lower-division courses are typically taken in the first or second year of undergraduate study, upper-division courses are typically taken in the third or fourth year of undergraduate study, and graduate courses are taken in post-baccalaureate study.

Actual faculty course loads may vary substantially from institutions' and departments' standard expectations, due to several factors. In assigning a course load to a given faculty member, an institution or department may consider other factors that affect teaching load, such as course level, class size, or number of new courses for which a faculty member must prepare. Many institutions and departments also consider a faculty member's research and service responsibilities. For instance, GMU has a standard expectation that faculty teach four courses per semester, but this expectation is reduced to two courses per semester for tenure-track faculty because 50 percent of their time is expected to be

spent on research. Some institutions and departments offer a reduced teaching load to certain prospective faculty members as a recruiting incentive.

In addition to institutional workload policies, incentives may impact how faculty members allocate their time. Institutions typically conduct annual performance reviews that weigh a faculty member's performance across teaching, research, and service activities. The weight institutions assign to each of these areas varies. VMI assigns equal weight to each area, and JMU assigns 60 percent of the faculty evaluation to teaching. Larger institutions such as UVA vary the weights by department. Likewise, institutions have varying policies for granting tenure and promotions.

Faculty in Virginia Report Working Over 50 Hours per Week on Average, 24 or More of Which Are Spent on Teaching Activities

Focus on Teaching and Research Faculty

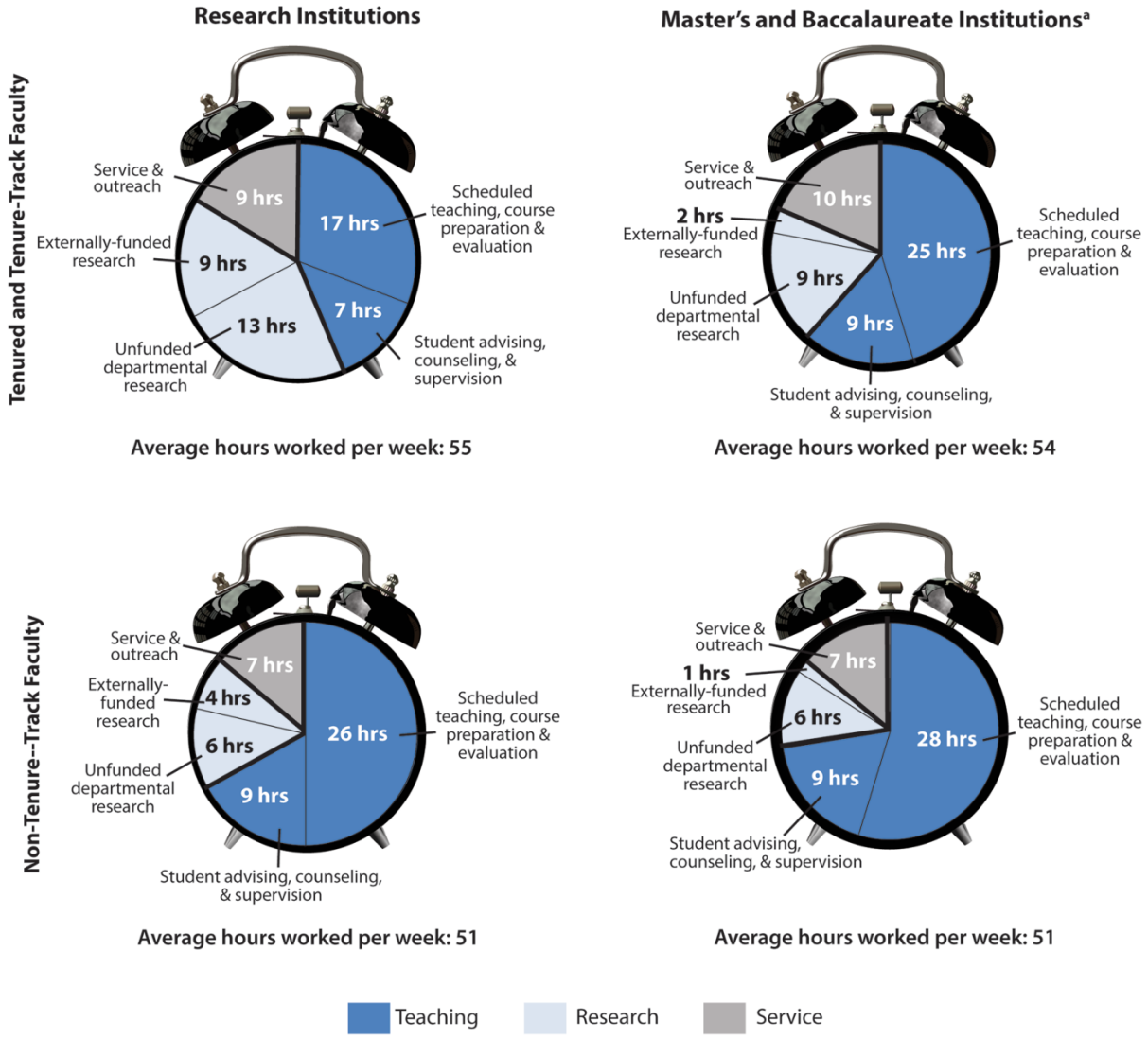
The discussion of faculty workload in this chapter focuses on the largest category of faculty, teaching and research faculty, because they are central to an institutions' mission.

Because institutions generally do not track how faculty members spend their time, JLARC staff conducted a survey of faculty members at Virginia's public four-year higher education institutions. Consistent with past studies done nationwide and in Virginia on this topic, the survey defined teaching, research, and service to include the activities most directly related to each category. However, some faculty activities span multiple categories. A faculty research project may involve the supervision of student research assistants, and many institutional staff believe that faculty engagement in research improves the faculty member's instructional quality.

Reflecting the varying institutional and departmental workload expectations discussed in the previous section, the number of hours that faculty reported working each week varied based on tenure status and institutional mission (Figure 13). Across the 15 institutions, full-time tenured and tenure-track faculty reported working 54 to 55 hours per week on average during the 2013 spring semester. Full-time non-tenure-track faculty reported working an average of 51 hours per week. In general, these reported hours are comparable to the average number of hours faculty reported working each week in past surveys conducted by other states and the U.S. Department of Education. (Appendix D shows results for each institution.)

The proportion of the workweek that full-time faculty reported allocating to teaching, research, and service activities also varied based on tenure status and institutional mission. Time spent on teaching activities ranged from 24 to 37 hours (44 to 73 percent of the workweek). Time spent on research activities ranged from seven to 22 hours (14 to 40 percent of the workweek). Time spent on service

Figure 13: Average Percentage of Workweek Spent on Teaching, Research, and Service Activities Varied by Type of Faculty and Institution, 2013 Spring Semester



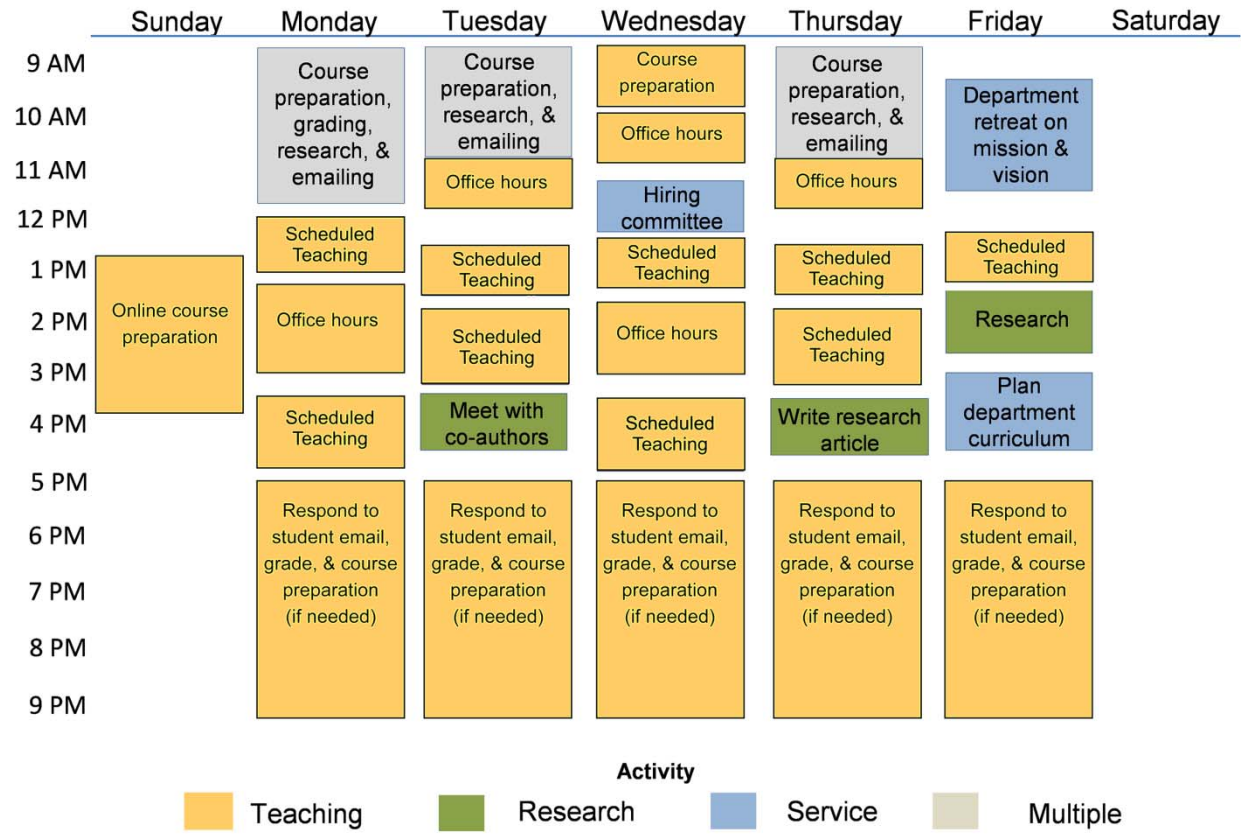
[a] Master's and baccalaureate institutions are shown together because results are not substantially different.

Note: Numbers may not add due to rounding. Data is for full-time faculty only.

Source: JLARC staff survey of teaching and research faculty at Virginia's public higher education institutions, 2013.

activities ranged from seven to 10 hours (13 to 18 percent of the workweek). In general, tenured and tenure-track faculty at research institutions spent the most time on research activities, and non-tenure-track faculty at master's and baccalaureate institutions spent the most time on teaching activities. Recent national data on how faculty spend their time was not available for comparison.

Figure 14: One Tenured Faculty Member at Master's Institution Spent More Time Teaching and Less Time on Research and Service (2013 Spring Semester)



Source: JLARC staff analysis of information provided by a health sciences tenured faculty member at a Virginia master's institution.

An example of a weekly calendar from a tenured faculty member at a master's institution in Virginia further illustrates how faculty allocate their time (Figure 14). This health sciences faculty member spent the majority of the workweek on teaching activities, both in the classroom and out of the classroom, preparing for class, grading, holding office hours, and responding to student email. Less time was spent on research activities, including writing articles and meeting with co-authors, and on service activities, including attending a faculty development retreat and serving on a department hiring committee.

Faculty Work a Comparable Number of Hours per Week on Average but Spend More Time on Research and Less Time on Teaching and Service Than in 1996

Compared to a faculty survey by SCHEV in 1996, faculty statewide reported working a similar number of hours per week in 2013.

Figure 15: On Average, Faculty Statewide Report Spending More Time Each Week on Research and Less Time on Teaching and Service Activities in 2013 Than in 1996

Note: Data represents full-time teaching and research faculty.

[a] Professional development activities, which accounted for 2.9 hours and were categorized in the 1996 survey as research activities, are recategorized here as service activities for consistency with the 2013 survey.

Source: JLARC staff analysis of 2013 JLARC staff survey of Virginia faculty and 1996 SCHEV survey of Virginia faculty.

Faculty also reported spending more time on research and less time on teaching and service activities than in the past (Figure 15). Full-time faculty statewide reported working an average of 55 hours per week in 1996 and 54 hours per week in 2013. The average number of hours per week spent on research reportedly increased from 9 to 17 hours (16 to 31 percent); time spent on teaching decreased from 33 to 28 hours (60 to 53 percent); and time spent on service activities decreased from 13 to 9 hours (24 to 16 percent).

Some of the difference in time allocation may be due to the time of year for which faculty were surveyed. The 1996 survey asked faculty to report their activities during the fall semester, but the 2013 survey, which was administered in the summer, asked about the spring semester, to enable faculty to more accurately recall their activities. Some faculty may teach more in the fall semester, when institutions tend to offer more large introductory courses. However, according to some institutional staff, the difference between the average faculty workload in fall and spring is minimal.

Changes in the average amount of time a faculty member spends teaching have the potential to impact higher education costs or instructional quality. For instance, depending on how efficiently faculty use their time, increases in the average amount of time a faculty member spends teaching may enable the institution to provide the same amount of instruction using fewer faculty, or may increase the amount of time faculty can spend with individual students. Conversely, decreases in the average amount of time a faculty member spends teaching may require the institution to hire additional faculty to provide the same amount of in-

struction, or may decrease the amount of time faculty can spend with individual students.

FACULTY TEACHING LOADS HAVE MARGINALLY DECLINED FOR TENURED AND TENURE-TRACK FACULTY, PARTLY IN AN EFFORT TO REMAIN NATIONALLY COMPETITIVE

While limited data on research and service prevented further analysis of these activities, teaching loads were further assessed from collected data. Teaching loads vary by institution and discipline, and they have marginally declined overall for tenured and tenure-track faculty and increased for other faculty. Teaching loads in Virginia do not appear to be consistently above or consistently below national averages.

Individual Instruction Course Sections

Course sections outside of regularly scheduled courses such as dissertation work, individual music lessons, and courses on special topics or readings.

Delaware Study Provides One of the Most Accepted Methodologies for Measuring Faculty Teaching Loads

JLARC staff assessed teaching loads using two measures from the University of Delaware's National Study of Instructional Costs and Productivity (Delaware Study). Course sections and student credit hours both quantify the amount of classroom instruction that faculty provide (Table 8). JLARC staff adopted these measures based on prior studies of faculty productivity, interviews with faculty productivity experts, interviews with staff at Virginia's public higher education institutions, and national data.

Course Credit

The academic value recorded for a student who successfully completes the course. A course is typically three or four credits, but supplemental courses such as laboratory, discussion, or recitation sections are frequently zero credits.

Assessments of teaching loads have inherent limitations. First, the assessments are often limited to measuring teaching in the classroom. They do not account for other teaching activities, such as class preparation, grading student coursework, and advising

Table 8: JLARC Staff Used Two Measures of Teaching Loads from the National Study of Instructional Costs and Productivity

Measure	Definition
Course sections	A unique group of students that meets with one or more instructors. This measure includes zero-credit course sections but excludes individual instruction course sections.
Student credit hours	Number of students taught multiplied by the credit value of the course section. For example, three student credit hours represent one student taking a three-credit course. This measure includes regularly scheduled and individual instruction course sections, but excludes zero-credit course sections.

Source: University of Delaware's National Study of Instructional Costs and Productivity, 2013.

students. Second, the assessments do not account for the quality of faculty instruction. One faculty member teaching four courses appears more productive than a faculty member teaching three, but the instructional quality of the former may be lower than that of the latter. Third, participation in national assessments like the Delaware Study is often limited. The data is difficult and time consuming for institutions to collect.

Despite these inherent limitations, the Delaware Study is one of the most accepted methodologies for measuring faculty teaching loads for several reasons. First, it provides a standardized method for assessing institutions' faculty teaching load data. This method includes an assessment of teaching loads for each Carnegie classification and discipline, which is important because much of the variation in teaching loads across institutions or within institutions over time may be due to variation in these factors. Second, the Delaware Study allows for state and national comparisons, because it obtains data from participating institutions nationwide using standardized methodology. Third, the Delaware Study independently reviews, verifies, and validates institutional data to ensure valid results in order to provide states and institutions with accurate comparisons to inform decision making.

Average Faculty Teaching Loads in Virginia Vary Widely by Type of Faculty, Institutional Mission, and Discipline

Faculty teaching loads reflect the diversity of Virginia's public four-year institutions. Teaching loads vary widely by type of faculty, institutional mission, and discipline. These factors must be considered when comparing faculty teaching loads across institutions.

Tenured and tenure-track faculty have lower average teaching loads than other types of faculty, because they tend to have more research and service responsibilities. During the fall 2010 semester, tenured and tenure-track faculty in Virginia taught an average of 193 student credit hours and 2.3 course sections. This teaching load was lower than that of non-tenure-track faculty, who taught an average of 297 student credit hours and 2.8 course sections, and supplemental faculty, who taught an average of 284 student credit hours and 3.5 course sections.

Faculty at research institutions have lower average teaching loads than faculty at master's and baccalaureate institutions, because they tend to have more research responsibilities. For example, tenured and tenure-track faculty taught an average of 183 student credit hours and 1.8 course sections at research institutions compared to 220 student credit hours and 3.8 course sections at master's and baccalaureate institutions in the fall 2010 semester.

Faculty teaching loads vary widely by discipline. Teaching loads, as measured by student credit hours and course sections, are lowest in disciplines that have smaller class sizes to allow for more individual instruction such as health, and highest in disciplines that typically have larger class sizes, such as chemistry and psychology. (Appendix I shows teaching loads for selected disciplines at each of Virginia's institutions.)

At Most Institutions, Average Teaching Loads Have Marginally Decreased for Tenured and Tenure-Track Faculty in Lower Levels of Instruction and Have Increased for Other Faculty

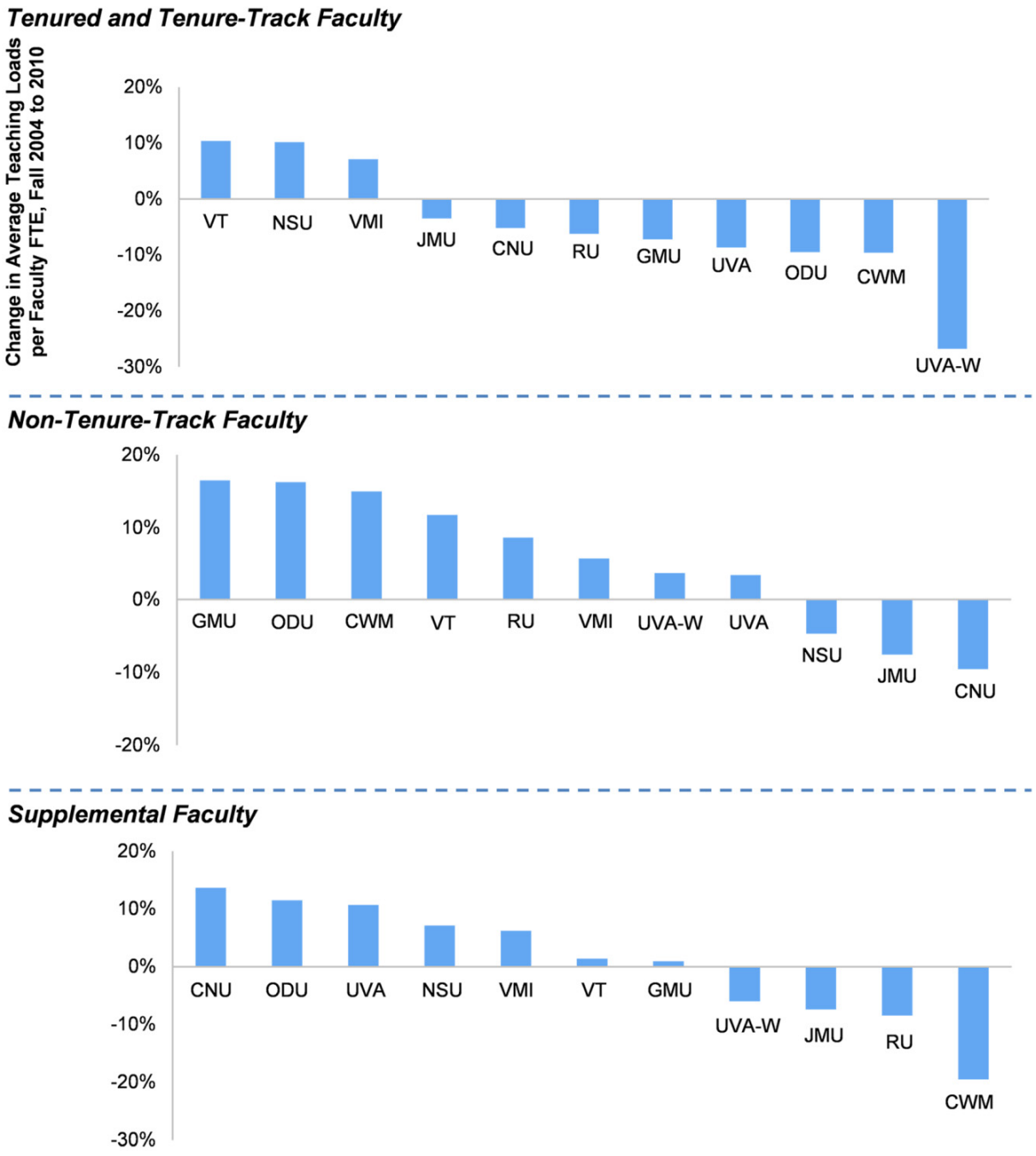
An assessment of changes to teaching loads over time should consider changes in student credit hours and course sections. Changes to these measures could indicate particular outcomes, such as transition to larger or smaller class sizes. For instance, an increase in the number of student credit hours that coincides with a decrease in the number of course sections taught would indicate a transition to larger class sizes.

Average teaching loads for tenured and tenure-track faculty in Virginia marginally decreased from 2004 to 2010. The average number of student credit hours taught per tenured and tenure-track faculty FTE has decreased at all but three institutions (Figure 16). These reductions ranged from three percent at JMU (eight student credit hours) to 27 percent at UVA-W (75 student credit hours per semester). Statewide, the average number of student credit hours that tenured and tenure-track faculty FTE taught declined by four percent (seven student credit hours), which represents approximately two students taking a three-credit course.

The average number of course sections taught per tenured and tenure-track faculty FTE decreased at all but two institutions. These reductions ranged from one percent at ODU to 19 percent at CWM. Statewide, the average number of course sections taught by these faculty declined by one percent. (Appendix I shows teaching loads for selected disciplines at each of Virginia's institutions).

The marginal decrease in average teaching load for tenured and tenure-track faculty generally occurred in lower levels of instruction. From 2004 to 2010, the average number of student credit hours and course sections that each faculty FTE taught in the lower division decreased statewide by nine and 11 percent, respectively. By contrast, the average number of student credit hours and course sections taught by a faculty FTE at the graduate level marginally increased.

Figure 16: Average Faculty Student Credit Hour Loads Marginally Decreased for Tenured and Tenure-Track Faculty and Have Increased for Other Faculty



Note: Data for LU, UMW, VCU, and VSU was unavailable. See Appendix B for more detail.

Source: JLARC staff analysis of fall 2004 and fall 2010 teaching load data provided by institutions.

Average teaching loads for non-tenure-track and supplemental faculty increased from 2004 to 2010. For non-tenure-track faculty, the average number of student credit hours taught per faculty FTE increased at eight institutions, ranging from three to 16 percent, and the average number of course sections taught increased at eight institutions, ranging from one to 59 percent. For supplemental faculty, the average number of student credit hours taught per faculty FTE increased at seven institutions, ranging from one to 14 percent, and the average number of course sections taught increased at three institutions, ranging from five to 43 percent.

The marginal increases in average teaching loads occurred in upper-division and graduate levels of instruction for non-tenure-track faculty, and at lower- and upper-division levels for supplemental faculty. The average number of student credit hours and course sections taught per faculty FTE increased statewide at these levels. By contrast, both the number of student credit hours and course sections taught per faculty FTE decreased in the lower-division level of instruction for non-tenure-track faculty and in the graduate level of instruction for supplemental faculty.

According to institutional staff, several factors may account for the changes in average teaching loads from 2004 to 2010. Changes in teaching load policies may account for some of the differences. At least four of Virginia's institutions have reduced, or considered reducing, their institution-wide standard teaching load policies for tenured and tenure-track faculty during the past decade. They have considered or implemented these reductions for several reasons, often including a desire to increase research and remain consistent with teaching load policies nationwide.

VMI's Reduced Teaching Load Policies

Prior to 2010, VMI required full-time faculty to teach four courses per semester in addition to time spent on service and student development activities. VMI staff report that this relatively heavy teaching load left insufficient time for faculty members to keep up with research in their discipline. VMI is therefore in the process of reducing the average course loads to three courses per semester in all departments to give faculty more time for research. According to VMI staff, this new course load policy is consistent with those of similar institutions nationwide.

It is difficult to determine the extent to which workload policies affect average teaching loads over time, because institutions often grant exceptions to the standard teaching loads.

Changes in the number of faculty also influence teaching loads over time. For instance, VT had the largest increase in average teaching loads for tenured and tenure-track faculty from 2004 to 2010. VT staff report that this increase was due to a reduction in size of the faculty body in response to State budget reductions. The number of tenured and tenure-track faculty FTE decreased by eight percent, but the total number of student credit hours that all tenured and tenure-track faculty were responsible for teaching only decreased by two percent.

Another factor that influences teaching loads is changes in the number of students who enroll in courses. NSU had the second largest increase in average teaching loads for tenured and tenure-track faculty from 2004 to 2010. This increase occurred because student enrollment increased faster than the number of faculty. The total number of student credit hours taught by all tenured and tenure-track faculty increased 16 percent, but the total number of tenured and tenure-track faculty FTE only increased five percent. By contrast, UVA-W had the largest decrease in average teaching loads for tenured and tenure-track faculty. University administrators reported that this decrease was partly because new majors offered by the institutions initially had low student enrollment.

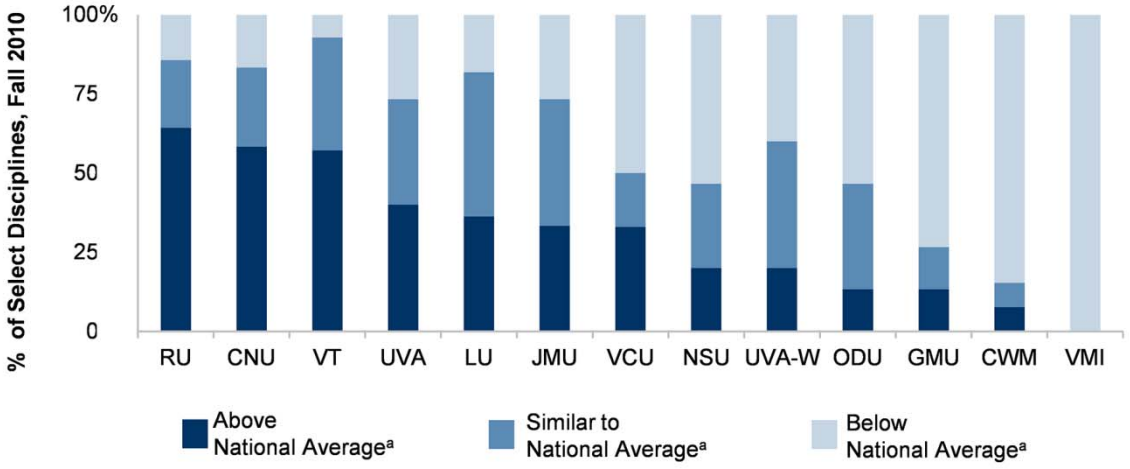
Changes in average class sizes also impact teaching loads. For instance, the average number of student credit hours taught by a tenured and tenure-track faculty member at UVA decreased by nine percent from 2004 to 2010. UVA staff report that this decrease was partly due to an intentional two percent decrease in average undergraduate class size. To fulfill an accreditation requirement that institutions improve aspects of student learning, UVA established a goal of offering more small classes, thus reducing the number of student FTEs taught by each faculty member.

Average Faculty Teaching Loads in Virginia Vary Widely From, But Are Not Consistently Above or Below, National Averages

Having faculty teaching loads that are comparable to those of faculty at similar institutions nationwide may improve an institution's ability to recruit high quality faculty. Faculty often consider workloads when deciding whether to stay at their current institution or where to take a new position. For example, UVA staff reported that on at least one occasion, workload was a factor in recruitment, when the university tried and failed to recruit a professor who instead took a job at a school that offered a lighter teaching load.

The comparability of Virginia's average teaching loads varies widely by institution, but Virginia does not appear to be consistently above or below national averages (Figure 17). To ensure more accurate comparisons, JLARC staff compared teaching loads to the national average for the given type of institution and discipline, since these factors may explain much of the variation in teaching loads across institutions. Across Virginia's institutions, an average of 31 percent of select disciplines were above the national average for the number of student credit hours per tenured or tenure-track faculty FTE. The percentage ranged from zero percent at VMI to 64 percent at RU. Similar variability occurred for other faculty types. (Appendix B explains how disciplines were selected for this analysis; Appendix I shows teaching loads for selected disciplines.)

Figure 17: Average Student Credit Hour Loads for Tenured and Tenure-Track Faculty Vary Widely But Do Not Consistently Differ From Those Nationwide (Fall 2010)



Note: Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions. This may result in some distortion relative to national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. Data for UMW and VSU was unavailable. See Appendix B for more detail.

[a] "Above" is more than 10% above national average; "similar" is within 10% above or below national average; "below" is more than 10% below national average.

Source: JLARC staff analysis of teaching load data provided by Virginia institutions and the University of Delaware's National Study of Instructional Costs and Productivity, fall 2010.

According to institutional staff, the same factors explaining differences over time within Virginia's institutions also explain the differences between teaching loads in Virginia and those nationwide. First, varying institutional or departmental workload policies may account for some of the substantial differences, but it is difficult to determine the extent to which they affect average teaching loads, because institutions often grant exceptions to the standard teaching loads.

Second, class sizes are a factor. For instance, VT had the highest average class size in the state (36 students) and the highest percentage of disciplines in which average student credit hour loads were above or similar the national average for tenured and tenure-track faculty. Conversely, VMI had the lowest average class size (16 students), and all of VMI's reported disciplines had average student credit hour loads that were below the national average, despite all of these disciplines having average course section loads that were above or similar to the national average.

Third, student enrollment appears to explain some of the substantial differences. For instance, VCU staff reported that an increase in student enrollment without a commensurate increase in the number of faculty caused tenured and tenure-track faculty student credit hour loads in their physics department to be more than three times the national average.

While JLARC staff, working with institutional staff, were able to identify factors that appear to explain variation from the national averages and over time in some outlier cases, institutions may benefit from a more comprehensive and ongoing assessment of such factors. Faculty workload benchmarking may help institutions identify opportunities to increase efficiency, particularly when they can control factors that contribute to the variation. In recognition of these benefits, 10 of Virginia's 15 public four-year institutions chose to participate in the Delaware Study for at least one year since the study's inception in 1996, including three Virginia institutions that participated in the most recent year.

Recommendation (3). Boards of visitors should consider requiring their institutions to conduct and participate in national faculty teaching load assessments that facilitate benchmarking average faculty teaching loads against similar institutions. The assessments should measure national average teaching loads by discipline and faculty type.

PERCENTAGE OF TOTAL INSTRUCTION PROVIDED BY TENURED AND TENURE-TRACK FACULTY HAS DECREASED DUE TO CHANGING FACULTY COMPOSITION AND WORKLOADS

Changes in faculty composition and teaching loads can impact the extent to which students are taught by a given type of faculty member. Many students and their families expect tenured and tenure-track faculty to provide the majority of instruction at institutions and believe that these faculty provide the highest quality instruction.

While there is no widely accepted standard on the amount of instruction that contingent faculty provide, some institutions have developed their own guidelines to balance cost efficiency and instructional quality. A CNU strategic plan goal is to have adjunct faculty teach no more than 20 percent of courses at the institution, for instance, while JMU and VSU have goals that adjunct faculty comprise no more than 20 percent of their faculty body. Some institutional staff note that the extent to which contingent faculty should be used can vary depending on (i) the level of instruction, with many institutions reportedly limiting adjunct faculty to lower levels of instruction that require less expertise; (ii) the discipline, with some professional disciplines like business reportedly benefiting from having adjunct instructors who are practitioners; and (iii) the region, with more adjuncts being available in northern Virginia and fewer in rural regions. In addition to institutional guidelines, institutions must meet an accreditation requirement that they have an adequate number of full-time faculty to support their mission.

Institutions in Virginia are decreasingly using tenured and tenure-track faculty to provide instruction, especially in undergraduate levels at research institutions (Figure 18). At research institutions, the percentage of total student credit hours that were taught by tenured and tenure-track faculty decreased 13 percent, from 54 percent in 2004 to 47 percent in 2010. This decrease occurred in the lower and upper division levels of instruction. Consequently, the percentage of total student credit hours that were taught by contingent faculty and teaching assistants in these instruction levels increased. A similar but much smaller shift occurred at master's and baccalaureate institutions. (See Appendix E for data by institution.)

FACULTY TEACHING LOADS CAN IMPACT INSTRUCTIONAL COSTS, BUT IMPACT VARIES AND IS OFTEN UNKNOWN

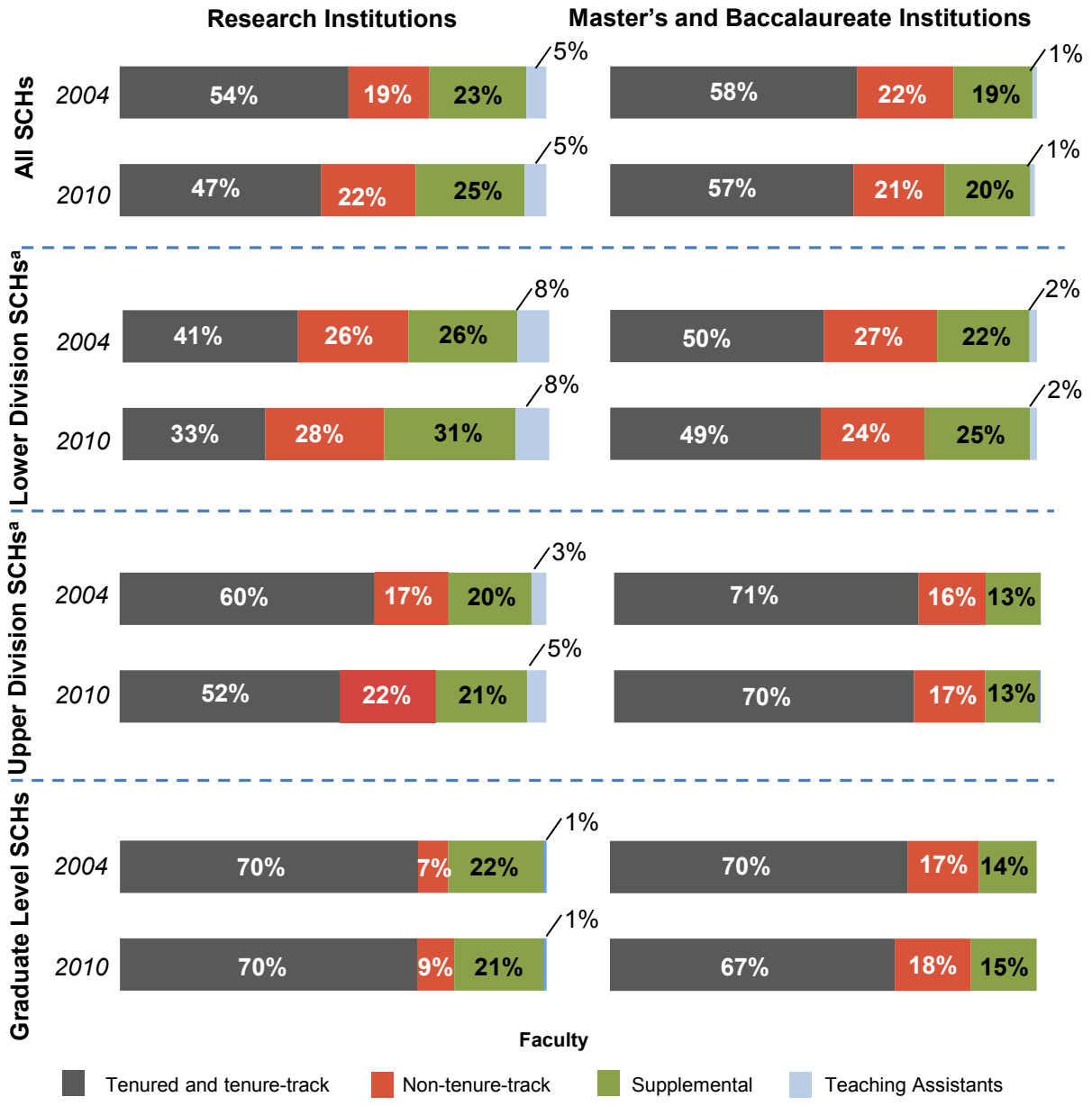
The extent to which changes in faculty teaching loads impact costs, if at all, depends on which implementation method or combination of methods, is used.

Institutions can alter average faculty teaching loads using a variety of methods that differ in cost. The primary methods include hiring or terminating faculty, changing class size, reducing or expanding course offerings, and reducing or expanding the frequency with which they offer courses. The extent to which changes in faculty teaching loads impact costs, if at all, depends on which method or combination of methods is used.

Limited Research Literature Finds Higher Faculty Teaching Loads May Reduce Instructional Costs

Few studies have assessed the impact of faculty teaching loads on instructional costs. This lack of research is likely due to the limited availability of national data on teaching loads. While several institutions and states have assessed teaching loads, they often define

Figure 18: Percentage of Student Credit Hours Taught by Tenured and Tenure-Track Faculty Decreased at Virginia Research Institutions at All Instruction Levels, 2004–2010



[a] Excludes undergraduate individual instruction course sections, which were not requested by course level.

SCH = student credit hour.

Note: Data for LU, UMW, VCU, and VSU was unavailable. Numbers may not add due to rounding. See Appendix B for more detail.

Source: JLARC staff analysis of teaching load data provided by Virginia institutions, fall 2004 and fall 2010.

faculty and teaching loads differently, making comparisons across studies difficult.

One exception is a study by the National Center for Education Statistics (2003), which found a statistically significant negative relationship between instructional costs and faculty teaching loads. Based on national data from the Delaware Study, four-year institutions with a higher number of student credit hours per faculty FTE generally had lower direct instructional costs per student credit hour. In several disciplines, average faculty teaching loads explained a substantial amount of the variation in direct instructional costs. The analysis controlled for the Carnegie classification, discipline, total amount of instruction being provided, number of faculty, and type of faculty.

Reduced Teaching Loads May Have Increased Instructional Costs at Some Virginia Institutions

Most Virginia institutions have not assessed the impact of changing teaching loads on instructional costs. Such assessments are difficult to conduct because of the decentralization of faculty workload decisions to department chairs or deans. Each department, therefore, may use different implementation methods.

Nonetheless, some institutions were able to estimate the cost of reducing institution-wide teaching load policies:

> ***Estimated Costs of Reducing Teaching Load Policies***
> *In 2004, UMW decided to reduce the ratio of students to faculty from 18:1 to 15:1. This reduction was intended to enhance instructional quality by (i) giving faculty more time to supervise students in internships, independent study, and undergraduate research; and (ii) giving students more flexibility in scheduling their courses by offering more, but smaller, sections of high-demand courses. The reduction was also intended to give faculty members more time for research and make UMW's course load policy more similar to those of comparable institutions nationwide.*
>
> *To reduce the student-faculty ratio, UMW planned to increase the number of faculty by 20 percent, from 197 to 237 faculty members. UMW staff reported that the cost of salaries, benefits, and office and lab equipment for hiring additional faculty for the 2005-06 academic year was $909,000, representing four percent of UMW's total instructional expenditures that year. The cost of continuing to fund those additional faculty and hiring 11 more for the 2006-07 academic year was $1.6 million, representing six percent of UMW's total instructional expenditures that year. UMW*

suspended implementation of this plan after two years to pursue improvements in instructional quality through other methods.

***

To improve its ability to recruit high quality faculty and provide faculty with more time for research, CNU reduced its course load policy in 2007 from seven to six courses per year for research-active tenured and tenure-track faculty. Approximately 34 percent, or 88 faculty members, taught the reduced course load in the 2012-13 academic year. Assuming the institution implemented the course load reduction by hiring both adjuncts and non-tenure-track faculty, CNU staff estimate that the reduction increased costs by $541,000 in the 2012-13 academic year. This cost estimate represented approximately two percent of CNU's total instructional expenditures in FY 2012. However, CNU staff report that some of these costs may have been offset by savings from improved recruitment and retention of faculty and students.

While CNU and UMW reduced teaching loads solely by hiring additional faculty, other institutions have taken other approaches that probably cost less but may have reduced instructional quality. For instance, staff at one research institution report that they increased average class sizes, began to rely more on non-tenure-track and supplemental faculty, and offered certain courses less often. NSU had planned to reduce teaching loads in 2009 by hiring additional faculty, reducing the number of course sections offered, reducing the frequency with which course sections were offered, and increasing class size. Using a combination of approaches likely mitigates the cost impact by reducing the number of additional faculty institutions have to hire. Some of these approaches may also reduce instructional quality.

LEGISLATIVE OPTIONS ARE LIMITED FOR LOWERING INSTRUCTIONAL COSTS BY INCREASING TEACHING LOADS

Although classroom teaching loads have only marginally declined and the impact on costs may vary, some states are interested in either maintaining or increasing teaching loads. However, state efforts to increase teaching loads have generally been ineffective, and many institutions believe that increasing teaching loads reduces instructional quality.

Legislative Efforts to Increase Faculty Teaching Loads Have Generally Been Ineffective

Interest in faculty teaching loads increased considerably among Virginia and other states in the late 1980s and early 1990s as states faced budget shortfalls. Twenty-three states regulated facul-

ty teaching loads in 1995, the most recent year for which data is available. Approximately half of these regulations were reporting requirements, while the other half were specific guidelines for teaching loads. State interest has continued since then, as several states have continued to assess and regulate faculty workloads.

Faculty Workload Reporting Requirements in Virginia and Other States Have Generally Been Ineffective. The Nebraska legislature previously required a biennial report on faculty productivity for approximately 10 years. According to the state's coordinating board staff, the reported data may not have been accurate and the legislature eliminated the requirement because it appeared to have no impact.

In Virginia, SCHEV and institutional staff stated that past faculty workload reports had no impact on institutional policies and practices. In the late 1990s and early 2000s, the Department of Planning and Budget and SCHEV reported on two performance measures: (i) the number of student credit hours per faculty FTE and (ii) the amount of research and public service expenditures per FTE faculty. SCHEV staff report that these performance measures had a limited impact on institutional policies because there were no associated performance goals or incentives.

Specific Teaching Load Guidelines in Other States Have Generally Been Ineffective. The Ohio legislature required professors to increase the amount of time spent teaching by 10 percent, but few faculty members reported that the requirement influenced their teaching loads. North Carolina requires faculty at public universities to teach a minimum number of courses that varies by Carnegie classification. State staff reported that changes in teaching loads were more attributable to state budget cuts than to the teaching load requirements, although the policy did emphasize the importance of teaching loads to institutions. One exception is Maryland, where institutions reportedly follow guidelines on the minimum number of course sections faculty are expected to teach. These guidelines also vary by Carnegie classification.

Increasing Incentives for Teaching May More Effectively Increase Teaching Loads. Institutional incentives, such as annual performance reviews and promotion and tenure standards, influence how faculty members balance their teaching, research, and service responsibilities. The research literature finds that changes in these institutional incentives, or the addition of new state incentives for teaching such as state performance funding, are likely to be more effective than direct efforts to regulate teaching loads.

As part of higher education restructuring, Virginia has provided incentive funding for institutions that meet a variety of perfor-

mance measures, including number of degrees conferred per faculty FTE. Institutions that meet negotiated performance thresholds for most or all measures receive financial benefits that include interest on non-general E&G funds and any unexpended annual appropriations. Some institutional staff stated that these incentives have not influenced their faculty workload policies or practices. Faculty workload may not even be a factor in meeting these thresholds. There are other ways to increase the number of degrees per faculty FTE, such as increasing graduation rates.

SCHEV administers an Outstanding Faculty Award program, established by the State in 1986 and now funded by the Dominion Foundation. Although all awards in this program consider teaching as part of their criteria, only one award, Teaching with Technology, is bestowed solely on the basis of instructional excellence. By contrast, North Carolina has provided over $130,000 annually for teaching excellence awards given to one faculty member from each public institution.

Many Institutions and Experts Assert That Increasing Faculty Teaching Loads Would Reduce Instructional Quality

Teaching loads can affect an institution's ability to compete for high quality faculty and the amount of time faculty can spend on each student.

Even if costs can be reduced by increasing teaching loads, this approach may reduce instructional quality in two important ways. First, heavy teaching loads can negatively affect an institution's ability to compete nationally for high quality faculty. Second, increasing teaching loads can decrease the amount of time faculty can spend on each student.

Staff at several institutions stated that an increase in teaching loads would decrease their ability to hire and retain high quality faculty. Because institutions compete for faculty in a national market, faculty can choose to work elsewhere if teaching loads at Virginia institutions are heavier than those at other schools in the U.S. Approximately 27 percent of faculty responding to the JLARC staff survey said they would look for another job if the number of students they have to teach increases. In the survey, many faculty members expressed similar concerns, with comments like the following:

> "It does not matter what you think [teaching loads] ought to be or what I think they ought to be. It only matters what the market thinks."
>
> ***
>
> "If my teaching load increases, I will most likely seek a job at another institution."
>
> ***

> "Increasing the teaching load without making room in a professor's already busy schedule is a recipe for losing the best professors to other institutions. Only the professors that can't compete for other jobs will remain."

Faculty productivity experts and institutional staff expressed concerns that increasing teaching loads would reduce the amount of time faculty could spend on each student, unless research or service responsibilities are correspondingly reduced. One expert gave the example of an English department that stopped assigning essays, which take more time to grade, in freshman English classes, to accommodate increased teaching loads. Similarly, law professors at a Virginia institution lowered the number of essay-based exams to reduce the time required to grade them. Lowering the number of open-ended exams gives faculty more time for activities other than grading, but it reduces the amount of qualitative feedback students receive. This approach may hinder student development of the critical thinking and writing skills that are essential to many disciplines.

Faculty members expressed similar concerns. Only 16 percent of faculty responding to the JLARC staff survey said they approved or strongly approved of their institution increasing teaching loads by increasing class sizes. The survey also asked faculty what methods they would most likely use to adapt to an increased teaching load. The most frequently cited methods included

- assigning fewer papers and other written work (60 percent);
- using more closed-ended forms of examination, such as multiple choice exams (46 percent); and
- spending less time per student in office hours and other mentoring or tutoring activities (39 percent).

Several faculty commented on the survey that increasing class sizes results in less discussion and interaction between faculty and students.

To address concerns about instructional quality, several institutions are focused on reducing costs by improving student learning outcomes rather than increasing faculty teaching loads. Improvements in student learning can indirectly reduce costs by reducing the number of times students retake courses, thus reducing their time to graduate.

Chapter 4 Impact of Instructional Technology on Costs and Learning Varies, and State Could Facilitate Collaboration

In Summary

There is no single definition of instructional technology in higher education, and its uses range from supplementing a traditional course to moving all learning experiences online. Four percent of total undergraduate student credit hours and eight percent of total graduate student credit hours in Virginia were delivered primarily through the internet or other electronic means in the 2011-12 academic year. These utilization rates are among the lowest of 14 southern and mid-Atlantic states. The best available studies find mixed results but indicate that instructional technology has the potential to reduce costs or improve student learning under certain circumstances. However, these studies have several limitations including small sample sizes and a reliance on case studies that may not be generalizable to other institutions, courses, or students. As instructional technology is still emerging in higher education, Virginia may wish to facilitate regular collaboration among its institutions on these efforts.

The study resolution directed JLARC staff to consider the use of instructional technology in its assessment of the cost efficiency of higher education. The Higher Education Opportunity Act (2011) also recognizes instructional technology as a means for cost-efficiently preserving and enhancing Virginia's higher education system. Instructional technology has received increased attention nationally over the past two decades. Among other reasons, this increased attention has been due to the common belief that instructional technology has the potential to decrease higher education costs while maintaining or improving student learning.

INSTRUCTIONAL TECHNOLOGY IS USED IN VARIOUS WAYS TO DELIVER INSTRUCTION, AND VIRGINIA USES IT LESS THAN OTHER STATES IN THE REGION

There is no single definition of instructional technology in higher education, and the definitions continue to evolve. In the absence of a single consistent definition, it is difficult to assess the impacts of instructional technology.

Instructional Technology Is Used in a Variety of Ways

The National Center for Academic Transformation describes four models of instructional technology: (1) supplementing a traditional course with technology; (2) replacing some in-class meetings with online activities; (3) replacing lectures with interactive computer software and on-demand personalized assistance; and (4) moving all

Exhibit 1: Virginia Institutions Use Instructional Technology in Four Primary Ways

Model	Definition	Virginia Example
Supplement	Retains the basic structure of a traditional course, but uses technology-based out-of-class activities to encourage greater student engagement with course materials. *Flipped classrooms* also focus in-class time on more interactive activities than a traditional classroom.	Two introductory economics courses at CWM used the flipped classroom approach with the intent of improving student learning. Basic concepts that were traditionally taught during class were moved to interactive online modules that students review before class. Class time then focuses on activities that apply the basic concepts.
Hybrid	Replaces some in-class meetings with online, interactive learning activities. Remaining in-class meetings are typically more focused on activities that require face-to-face time with instructors.	To accommodate increasing student enrollment while maintaining instructional quality, JMU reduced the number of times an introductory psychology course section met each week from two to one. Narrated lectures from the eliminated meetings were placed online for students to review outside class. During the remaining class time, students have an opportunity to ask questions, have discussions with faculty and students, and take proctored exams.
Emporium	Replaces lectures with a learning resource center featuring interactive computer software and on-demand personalized assistance.	To accommodate increasing student enrollment and improve student learning, students in seven math courses at Virginia Tech learn independently through interactive software at a facility, as their schedule permits. Faculty and staff are available at the facility to provide assistance as needed.
Fully Online	Moves all learning experiences online, although faculty are still required to interact with students.	ODU offers several fully online courses and degree programs for residential and non-residential students to expand access to higher education. These courses are delivered in a variety of ways, ranging from self-paced online learning to participation in live broadcasts that enable students and faculty to interact.

Note: Table excludes two additional models identified by the National Center for Academic Transformation because no Virginia institutions appear to be using them.

Source: JLARC staff analysis of information from the National Center for Academic Transformation and Virginia institutions, 2013.

learning experiences online. All four models are used to varying extents across Virginia's public higher education institutions (Exhibit 1).

Institutions in Virginia and nationwide report several reasons for using instructional technology. The most commonly cited reason is to expand student access to courses while maintaining instructional quality. Several institutions reported goals of improving instructional quality and responding to employer and student demand.

VT, for instance, noted that students need to be able to utilize technology in their future careers. The reason cited least often was to reduce the cost of higher education.

Virginia Institutions Use Instructional Technology Less Than Other States in the Region

Information on the prevalence of instructional technology in higher education is generally limited to courses that are delivered primarily online, such as hybrid and fully online courses. The data does not consistently define an online course. Nonetheless, available information indicates that many institutions and students are using instructional technology.

Online Degree Programs in Virginia

Several of Virginia's institutions offer online degree programs, which are defined by SCHEV as degree programs that are offered entirely online or involve only minimal face-to-face contact.

In 2012, Virginia's public four-year institutions offered 24 bachelor's programs, 75 graduate degree programs, and 44 graduate-level certificates online. Seven institutions did not offer online degree programs.

The percentage of students who make use of online instruction has increased steadily. According to a national survey, the percentage of students at higher education institutions who take at least one online course increased from 10 percent in 2002 to 32 percent in 2011. The survey defined online courses as those in which at least 80 percent of the content is delivered online and in which face-to-face meetings typically do not occur.

The use of instructional technology in Virginia varies by institution and is concentrated at a few institutions (Table 9). In the 2011-12 academic year, the percentage of the institution's total student credit hours that were delivered primarily through the internet or other electronic means ranged from zero at CWM, CNU, and VMI to 15 percent at ODU and NSU. Five institutions accounted for almost 80 percent of the total student credit hours in Virginia that were delivered electronically.

The six-year plans of nearly all Virginia institutions indicate that they intend to expand the use of instructional technology in response to the Higher Education Opportunity Act, but some institutions have been less willing than others to do so. UVA-W and VMI reported that fully online courses generally do not fit with their institutional mission or their small size. CNU uses instructional technology to supplement some courses but asserts that hybrid or fully online courses do not fit the pedagogical model that CNU has promised to faculty and students.

Virginia's public four-year institutions use instructional technology less than those in most southern states (Table 10). Four percent of total undergraduate student credit hours in Virginia were delivered primarily through the internet or other electronic means, the second lowest percentage of 14 southern and mid-Atlantic states. Eight percent of total graduate student credit hours in the State were delivered electronically, the lowest percentage of 14 southern states.

Table 9: Use of Instruction Technology Varies by Institution (2011-12)

	SCHs delivered electronically[a]	% of institution's SCHs delivered electronically[a]	% of State total SCHs delivered electronically[a]
ODU	85,392	15%	34%
VCU	34,151	4	13
GMU	29,167	4	12
NSU	26,018	15	10
VT	25,972	3	10
JMU	19,741	3	8
UVA	11,376	2	4
LU	9,880	7	4
UMW	5,598	4	2
RU	3,441	1	1
UVA-W	1,704	3	1
VSU	1,044	1	0
CWM	0	0	0
CNU	0	0	0
VMI	0	0	0

[a] A course is considered to be delivered electronically if more than 50% of content is delivered through the internet, two-way audio/video, or other similar means.

SCH = student credit hour.

Source: Data provided by SCHEV and VMI, 2011-12 academic year.

Table 10: Virginia Delivers Less Instruction Electronically Than Other Southern and Mid-Atlantic States (2011-12)

State	% of undergraduate SCHs at public four-year schools delivered electronically[a]	% of graduate SCHs at public four-year schools delivered electronically[a]
Maryland[b]	18%	40%
Florida[c]	18	21
Tennessee	14	26
Oklahoma	14	22
Arkansas	12	39
Alabama	12	28
Kentucky	11	28
West Virginia	10	26
Texas	10	23
Mississippi	9	22
North Carolina	9	19
South Carolina	4	17
Virginia	**4**	**8**
Delaware	3	10

[a] A course is considered to be delivered electronically if more than 50% of content is delivered through the internet, two-way audio/video, and other similar means.
[b] Includes University of Maryland University College, which specializes in online degrees.
[c] Florida considers a course to be electronically delivered if 80% of content is delivered electronically.

SCH = student credit hour.

Source: JLARC staff analysis of the Southern Regional Education Board Fact Book, 2013.

COST IMPACT OF INSTRUCTIONAL TECHNOLOGY VARIES, BUT SOME CONDITIONS MAY BEST FACILITATE COST REDUCTION

According to the research literature, instructional technology can theoretically impact institutional costs in three direct ways. First, it can reduce the need to build instructional facilities. Second, it can reduce the amount of time faculty need to teach each student. Third, it can enable institutions to replace higher-cost faculty such as tenured professors with lower-cost faculty such as graduate assistants. The extent to which technology can increase or decrease costs depends on how the cost of the technology compares to the cost of the capital or labor it replaces. These substitutions typically occur in hybrid, emporium, and fully online courses, but not in supplemented courses that do not use technology to reduce the number of in-class meetings or increase class size.

Tuition for Technology-Enhanced Courses

Students who take technology-enhanced courses at Virginia's public four-year institutions often pay tuition that is the same as, or higher than, tuition for traditional courses.

ODU and VT, which account for over 40 percent of statewide student credit hours that are delivered electronically, charge the same tuition rates. GMU and LU charge an additional $25 and $38 fee per credit hour, respectively, for some fully online courses.

Emerging Research Literature Finds Potential for Short- and Long-Term Cost Savings, But Studies Have Substantial Limitations

While numerous studies have assessed the impact of instructional technology on higher education costs, most are case studies with limitations that prevent generalizability. Limitations include narrow focus (on a single course) and small sample sizes. Nonetheless, the best available studies indicate that there is a potential for short- and long-term cost savings.

Course Redesign

When academic courses are redesigned to incorporate instructional technology, it is usually done to achieve certain goals, such cost reduction or improvement of learning outcomes.

In case study assessments of 32 varying course redesigns at several institutions and disciplines, the National Center for Academic Transformation found that all 32 experienced cost savings in the first year that ranged from 13 to 77 percent. The Center reported similar findings in its work with state higher education systems in Arizona, Mississippi, Missouri, New York, Tennessee, and Maryland. However, Center staff report that these short-term assessments did not include (i) course development costs, in order to focus on the ongoing costs that institutions could expect to experience over the long term; (ii) institution-wide support services, infrastructure, and equipment costs, because they are hard to quantify since they also serve other institutional operations; and (iii) course-specific instructional software costs, because they vary depending on what resources an institution already has.

A study by Bowen et al. (2012) simulated the potential for cost savings three to five years after implementing a hybrid introductory statistics course at three public institutions and found that the hybrid courses offered opportunities for substantial savings in faculty compensation. However, the authors state that their results are highly speculative and extremely sensitive to institutions' faculty compensation rates and class sizes. Furthermore, the study did not assess the impact on facilities costs or technology support costs.

Virginia Schools Report Mixed Cost Impacts, and Certain Conditions May Best Facilitate Cost Reduction

Institutions in Virginia have not systematically assessed the impact of instructional technology on their costs. Most of Virginia's institutions do not redesign courses with the goal of reducing costs, as discussed earlier. Furthermore, it is difficult for institutions to enumerate certain costs like facilities and technology support services that serve multiple purposes.

Nonetheless, staff at several institutions emphasized that technology-enhanced instruction is typically not less expensive than traditional instruction, although it may be in the long run. They reported several types of costs that are generally associated with instructional technology, many of which are short-term startup costs (Table 11). Costs may vary substantially, depending on which instructional technology model is used, for example, and which resources are already available at the institution.

Table 11: Several Startup and Ongoing Costs are Generally Associated with Instructional Technology

Typical Startup Costs	Typical Ongoing Costs
Course designers	Faculty compensation
Video production services	Facilities
Software licensing	Faculty training
	Technology maintenance
	Technical support for students and faculty
	Quality assurance evaluations

Source: JLARC staff analysis of interviews with institutional staff and the instructional technology literature.

Building on the Virginia examples in Exhibit 1, the often unknown and varying impact of instructional technology on direct costs is illustrated in Exhibit 2. The direct cost impacts range from an estimated increase to an estimated 77 percent reduction in costs.

Institutional staff noted that several benefits of instructional technology cannot be quantified. For instance, hybrid and fully online courses reduce the need for students and faculty to commute to campus and can better accommodate their schedules. Instructional technology may create a potential for future cost savings by better enabling institutions to accommodate future enrollment growth.

According to interviews with institutional staff, the research literature, and interviews with instructional technology experts, the potential to lower costs may be greater under certain conditions. Examples include (1) courses that do not change much over time, so fewer software revisions are needed; (2) courses that are offered more often, which spread out the up-front costs and benefit

Exhibit 2: Direct Impact of Instructional Technology on Costs Varies Depending on the Model and Is Often Unknown

Model	Virginia Example
Supplement	CWM's flipped economics courses increased instructional costs in the first year by $40,000 due to one-time software development costs that would not be incurred in later years unless software modifications are made. No direct cost savings were achieved in the first year from decreasing the amount of time faculty needed to teach each student because the number of course meetings was not reduced and class sizes were not increased.
Hybrid	The course redesign incurred costs that JMU staff could not quantify for supporting both technology and faculty. However, the hybrid format allows JMU to teach the same number of students using fewer full-time faculty, reducing annual faculty costs from an estimated $160,000-$200,000 to $100,000 (38 to 50 percent). Faculty costs in the hybrid format are comparable to, or less than, the cost of using adjunct faculty to teach the same number of students, depending on whether each adjunct teaches enough courses sections to be considered full-time and thus receives health benefits.
Emporium	VT reduced its cost per student from $91 to $21 (77 percent) in the first year of using the emporium model for linear algebra, excluding course development and software costs. The savings were mainly from replacing tenure-track faculty with fewer non-tenure-track faculty and teaching assistants.
Fully Online	ODU staff report that their fully online courses do not reduce costs. Their approach adds technology and infrastructure costs, which are hard to quantify, to the costs of traditional instruction. ODU staff report their costs are substantially higher than those of for-profit online universities because ODU uses more expensive faculty, who also have other responsibilities like research, and invests heavily in course development.

Note: Excludes indirect cost impacts, such as those related to changing instructional quality.

Photos: VT math emporium (top), ODU distance learning control room (bottom right), ODU video production studio (bottom left).

Source: JLARC staff analysis of information provided by, and interviews with, CWM, JMU, VT, and ODU.

more frequently from cost savings; (3) large enrollment courses, which spread out the up-front costs and benefit from economies of scale; and (4) courses offered in institutions and departments that are experiencing enrollment growth. A course redesign may reduce the number of faculty an institution needs to teach the same number of students, but tenured faculty cannot be terminated. Institutions experiencing enrollment growth may be able to utilize these tenured faculty in the near future, though, as more students enroll. However, some experts emphasize that studies have not tested these theories.

LEARNING IMPACT OF INSTRUCTIONAL TECHNOLOGY VARIES, BUT SOME CONDITIONS MAY BEST FOSTER LEARNING

Many institutions in Virginia emphasized that they want to use instructional technology to improve student learning, or at least maintain student learning, while focusing on other goals such as increasing access or reducing costs. Improvements in student learning may indirectly decrease the cost of higher education for students by reducing the number of times they need to retake courses in order to pass them, thus reducing the time it takes to graduate.

Instructional technology can theoretically impact student learning by changing the level of student engagement with course material. Flipped classes, for instance, require students to learn basic concepts online so class time can focus on interactive activities that deepen students' understanding of the concepts. Instructional technology can customize the learning experience to each student by identifying a concept that a student is having difficulty mastering, automatically generating quizzes tailored to mastering the concept and constantly assessing student performance. The extent to which instructional technology impacts student learning likely depends on how much a course utilizes technology in these ways and how these instructional methods interact with a particular student's learning style.

Research Literature Finds Mixed Impacts on Student Learning, and Studies Have Substantial Limitations

Many studies have assessed the impact of instructional technology on student learning, but like the studies of cost impacts, they have several limitations. In addition to small sample sizes, most student learning impact studies allowed students and faculty to select the course format in which they wanted to participate. The best available studies have found mixed results.

The most rigorous assessment to date, Bowen et al. (2012), found no statistically significant differences in student learning outcomes of students in traditional versus hybrid sections of an introductory

statistics course taught at six public institutions. This result held across all student subgroups defined by race, gender, parental education, pre-test scores, and college grade point average. The study controlled for differences in student characteristics by randomly assigning students to the different course formats. Still, the initial sample of students was self-selected, and the study was unable to control for differences in instructor quality.

Other studies found positive impacts of instructional technology on student learning. A U.S. Department of Education meta-analysis (2010) found that both hybrid and fully online courses had statistically significant improvements in student learning compared to traditional courses, and that improvements were greater in the hybrid courses. However, most studies included in the meta-analysis had sample sizes of fewer than 100 students and involved health care fields. Similarly, using 42 case studies of various course redesigns at several institutions, the National Center for Academic Transformation found improved student learning in 30 cases and no substantial difference in the remaining 12. However, these before-and-after assessments typically did not control for changes that may have occurred during implementation, such as grading systems or instructors, and relied on case studies rather than large-scale implementations.

Finally, Xu and Jaggars (2013) assessed data from over 40,000 community and technical college students taking nearly 500,000 courses in Washington and found that course completion and course grades were significantly worse in online courses than traditional courses. Males, younger students, black students, and students with lower grade point averages particularly struggled. However, the study results may not be generalizable to four-year institutions.

Virginia Schools Report Mixed Student Learning Impacts, and Certain Conditions May Best Foster Learning

Virginia institutions report that instructional technology has had mixed impacts on student learning (Exhibit 3). Institutions in three of the four examples discussed previously concluded that there was no impact on student learning, and one concluded that there were improvements in some measures of student learning but a decline in another. However, these assessments were generally unable to control for factors such as differing student characteristics.

According to interviews with institutional staff and instructional technology experts, the potential to maintain or improve student learning in technology-enhanced courses may be greater under

Exhibit 3: Impact of Instructional Technology on Student Learning Varies

Model	Virginia Example
Supplement	Based on an analysis of student course evaluations and exam questions, student performance in CWM's flipped economics courses did not appear to differ systematically from that in the previously taught traditional course, although outcomes appeared to improve for some students. However, CWM staff caution that the assessment was unable to control for several factors including differing student characteristics.
Hybrid	Based on a statistical analysis of average exam scores, JMU's psychology department concluded that the instructional quality of one hybrid psychology course was similar to that of the traditional course concurrently taught by the same instructor. Similarly, course grades and the percentage of students withdrawing or receiving a D or F grade were not statistically different. However, students rated the traditional course more favorably on all course evaluation items, except that they rated the hybrid course higher on the amount of critical thinking. This assessment did not control for factors such as student characteristics.
Emporium	There was no statistical difference in the first year between course grades in the VT linear algebra emporium course and the prior traditional course, but there was statistically significant improvement in the percentage of students completing the course. Final exam scores also appeared to improve, after controlling for some student characteristics, but the final exam questions were changed during the course redesign. Finally, performance appeared to decline on exam questions related to certain concepts. Like other NCAT case studies, this before-and-after assessment did not control for changes during implementation such as grading systems.
Fully Online	ODU staff conclude that their fully online courses have no substantial impact on student learning. The average course completion rate was 93% in traditional classes compared to 92% in fully online courses, although this comparison does not control for factors such as differing student and faculty characteristics. One assessment found no statistically significant differences in final exam grades or student satisfaction in several courses delivered traditionally versus via satellite or live video streaming. This assessment was limited to courses in which the same instructor taught both the traditional and online versions, but students were allowed to select which version they took.

Photo: VT classroom designed to foster interaction among students and faculty through group activities and problem solving. This type of classroom is often used in supplemented and hybrid courses in which class time is focused on applying knowledge learned outside the class.

Source: JLARC staff analysis of information provided by, and interviews with, CWM, JMU, VT, and ODU.

certain conditions. These conditions include (1) lower-level courses in which content is more basic and lends itself to automated assessment and (2) disciplines in which the development of writing or critical thinking skills is less integral. However, some experts emphasize that no studies have tested these theories.

HIGHER EDUCATION INSTRUCTIONAL TECHNOLOGY IS STILL EMERGING, AND STATE COULD FACILITATE COLLABORATION

Many experts, institutional staff, and faculty emphasize that instructional technology is not a "silver bullet" for reducing costs or improving student learning.

Many experts, institutional staff, and faculty emphasized that instructional technology is not a "silver bullet" for reducing costs or improving student learning. Care needs to be taken in designing and supporting technology-enhanced courses, because there is no single approach that has been shown to be best at all schools. The best model for integrating instructional technology into a given course depends on several factors including the subject matter, the student body, and student enrollment.

Virginia has provided support for the use of instructional technology in higher education. ODU received $4 million of general funds in FY 1994 and ongoing support since then for its TeleTechNet system, which allows community college transfer students to complete their undergraduate degrees at ODU. The State has provided an average $2.7 million annually in general funds during FY 2005 through FY 2013 to the Commonwealth Graduate Engineering Program, which has enabled individuals to take offsite graduate engineering courses at five Virginia institutions (GMU, ODU, UVA, VCU, and VT) since the early 1980s. Four Virginia institutions (GMU, JMU, UVA, and VT) have pooled $3.4 million annually of State general funds since 2010 for 4-VA, a partnership that, among other initiatives, supports course redesigns and shares foreign language courses among the four participating institutions using instructional technology.

Considering that instructional technology is still emerging in higher education, the State may wish to facilitate collaboration among its institutions on these efforts. Several experts and institutional staff suggested states can play a role in sharing best practices and resources among institutions. For instance, the University System of North Carolina has a facilitator who coordinates instructional technology efforts across the system's institutions. Similarly, the Virginia General Assembly authorized SCHEV to form the Learning Technology Advisory Committee in 2006 to help develop instructional technology initiatives, share related best practices, and improve cooperation among institutions. The Committee has not been in operation due to a lack of funding. SCHEV has formed ad hoc groups as needed in its absence, such as a group to plan a recent OpenVA conference for sharing instructional technology practices across institutions.

Although SCHEV staff report that the ad hoc groups have worked well, the State may benefit from funding one additional full-time SCHEV staff member to coordinate a more permanent committee of institutional representatives, such as the previously authorized Learning Technology Advisory Committee. In addition to the previously mentioned objectives, the committee could regularly identify instructional technology initiatives and best practices for directly or indirectly lowering institutions' instructional expenditures per student while maintaining or enhancing student learning.

Recommendation (4). The General Assembly may wish to consider appropriating funding for the State Council of Higher Education for Virginia to coordinate a committee of institutional representatives, such as the previously authorized Learning Technology Advisory Committee. In addition to the objectives set out in the Appropriation Act for the Learning Technology Advisory Committee, the committee should identify instructional technology initiatives and best practices for directly or indirectly lowering institutions' instructional expenditures per student while maintaining or enhancing student learning.

Chapter 5 Shift Toward Research Institutions and STEM-H Will Likely Continue to Increase Costs

In Summary

For a variety of reasons, Virginia's research institutions spend about 51 percent more on instruction per student credit hour than Virginia's master's and baccalaureate institutions. The majority of enrollment growth in recent years has occurred at Virginia's research institutions. About two-thirds of the increase in instructional spending statewide since 2005 can be explained by the enrollment growth at these higher cost research institutions. Student enrollment has also shifted slightly toward STEM-H disciplines, which tend to be more costly to provide than other academic disciplines. STEM-H instructional spending per student credit hour, for example, is $217 at Virginia's master's and baccalaureate institutions—almost a third more than spending to provide non-STEM-H instruction. The State has recently encouraged growth in these more costly STEM-H disciplines and this emphasis on STEM-H will likely continue to increase the cost of instruction.

A 2003 study of instructional costs by the National Center for Education Statistics (NCES) cited institutional mission (as measured by Carnegie classification) and the mix of academic disciplines offered by institutions as accounting for more than 80 percent of the variation in instructional costs between institutions. Due to the influence institutional mission and discipline offerings have on instructional costs, JLARC staff analyzed instructional cost per student credit hour across Virginia's public higher education institutions. The analysis accounted for institutional mission by assessing average instructional costs at research institutions and master's and baccalaureate institutions separately, as well as average instructional costs by academic discipline.

MAJORITY OF ENROLLMENT GROWTH OCCURRED AT RESEARCH INSTITUTIONS WITH HIGHER INSTRUCTIONAL COSTS

Because of the wide array of academic disciplines offered at each institution, instructional cost per student credit hour was measured for a sample of 15 academic disciplines. To account for institutional mission, JLARC staff used the Carnegie classification to sort Virginia institutions into two groups: (1) research and (2) master's and baccalaureate.

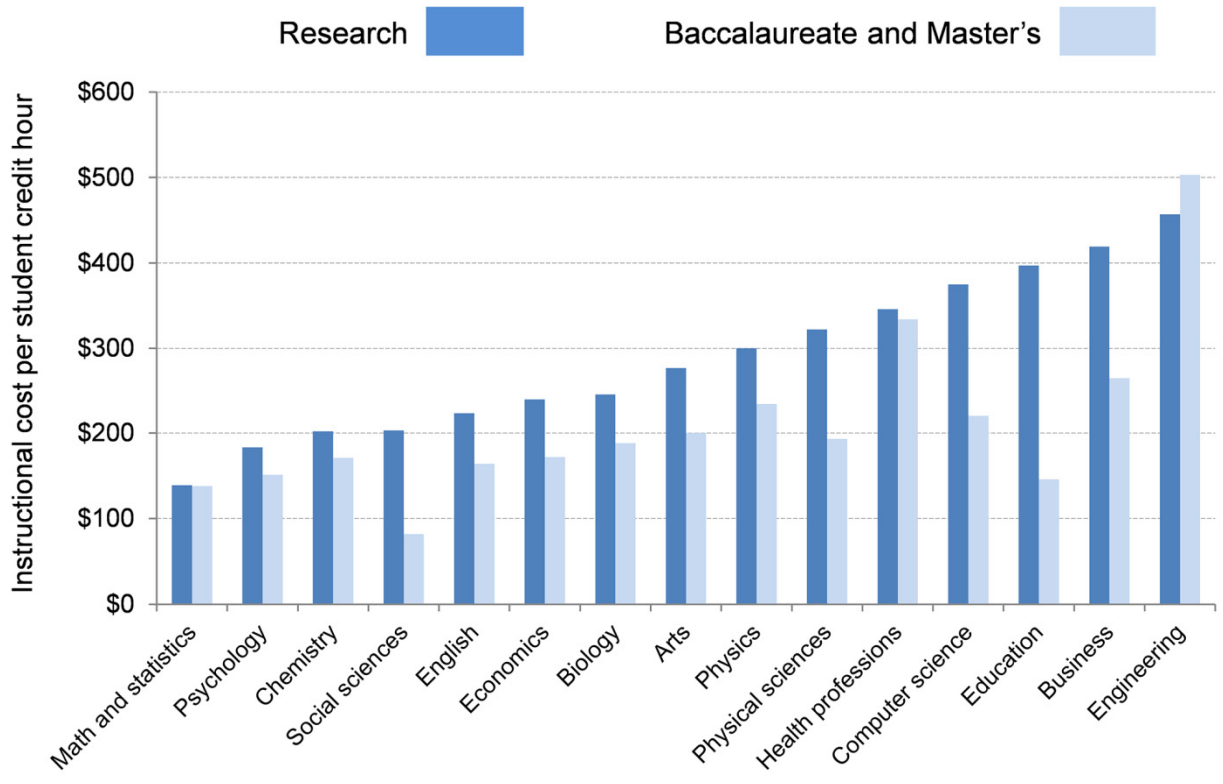
Instructional Cost per Student Credit Hour is Higher at Research Institutions Than at Master's and Baccalaureate Institutions

In FY 2012, Virginia's six research institutions had average instructional expenditures of $333 per student credit hour, 51 per-

cent greater than the average instructional costs at the nine master's and baccalaureate institutions ($221). Furthermore research institutions had higher instructional cost per student credit hour than master's and baccalaureate institutions for 14 of 15 academic disciplines (Figure 19). For example, research institutions spent an average of $322 per credit hour in the physical sciences discipline, which was $129 (67 percent) more than Virginia's master's and baccalaureate institutions.

The difference in average instructional costs between research institutions and master's and baccalaureate institutions in Virginia is consistent with national trends. As noted in Chapter 1, national data indicate that public research institutions spend, on average, considerably more on instruction than other public institutions. Prior studies of average instructional costs, as well as institutional administrators and experts in higher education, identify several factors related to research and graduates missions that increase average instructional costs.

Figure 19: Virginia's Research Institutions Have Higher Cost Per Credit Hour For Most Academic Disciplines Selected



Note: Figures do not include instructional expenditures for NSU and VSU. VCU was only able to provide expenditures in select disciplines. Several master's and baccalaureate institutions reported expenditures for some disciplines that included expenditures in other disciplines (e.g., economics report as part of business). (Additional details in Appendix B.)

Source: JLARC staff analysis of institutional direct instructional expenditure by discipline and SCHEV credit hour enrollments by discipline.

First professional degrees

First professional degrees are those required to begin practice in a profession, and require at least two years of college work before entering the program and at least six academic years of college work to complete the degree program. Examples of first professional degrees include Law (LLB or JD), Medicine (MD), or Veterinary Medicine (DVM).

Research Institutions Deliver Most Graduate Instruction in Virginia, Which Costs More to Provide. Graduate instruction is more expensive to provide than undergraduate instruction for several reasons. Master's, doctoral, and "first professional" degree programs typically have lower student-faculty ratios; smaller class sizes; greater expenditures on scholarships, stipends, and other tuition discounts; and greater use of equipment and supplies. Nationwide, faculty who teach only graduate courses also tend to receive higher levels of compensation.

The volume of graduate instruction in Virginia increased by 10 percent between FY 2005 and FY 2012. Baccalaureate and master's institutions had the fastest increases in graduate instruction at 30.3 percent over the period, as compared to 15 percent overall growth in instruction at that Carnegie level. Graduate instruction grew at a slower rate at research institutions, increasing by 7.3 percent statewide. This was a lower increase than the 17 percent overall increase in student credit hour enrollment at research institutions.

The higher average instructional costs at Virginia's research institutions are likely attributable in part to a greater focus on graduate instruction. In FY 2012, research institutions provided 68 percent of all instruction and 86 percent of total graduate instruction.

Research Institutions Have Higher Personnel and Non-Personnel Expenditures Related to Instruction. In the disciplines analyzed by JLARC staff, research institutions had much higher average personnel and non-personnel expenditures than master's and baccalaureate institutions. Personnel expenditures per student credit hour were 59 percent higher at research institutions ($264) than at other schools ($166). Research institutions also spent more than twice as much on non-personnel expenditures ($29) per student credit hour than master's and baccalaureate schools ($13).

The primary reason average personnel expenditures are higher at research institutions is the higher average faculty salaries. According to data provided by institutions, tenured and tenure-track faculty at research institutions make approximately $106,000 on average, which approximately 46 percent higher than the $72,600 average salaries of tenured faculty at master's and baccalaureate institutions. This is consistent with the finding in Chapter 2 that faculty involved in research are typically more highly compensated than those who are not.

Average non-personnel expenditures are also higher at research institutions due to their greater amounts of graduate instruction, and increased use of equipment and research activities in instructional environments. In the 15 disciplines analyzed by JLARC

staff, at research institutions, non-personnel costs represented 10 percent of direct instructional expenditures in FY 2012, compared to 7 percent at master's and baccalaureate institutions.

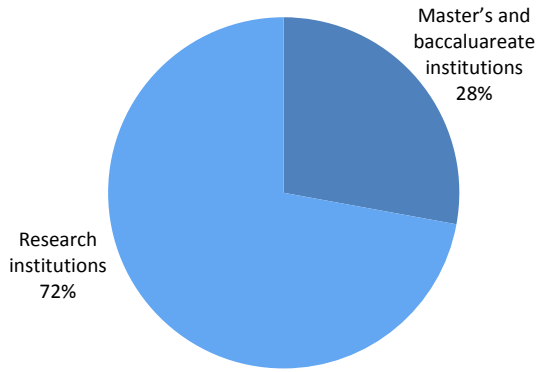
Tenured and Tenure-Track Faculty at Research Institutions Teach Fewer Courses, Likely Increasing Average Instructional Costs. Tenured and tenure-track faculty at research institutions are typically expected to allocate more of their time to research than faculty at master's and baccalaureate institutions, and thus teach fewer courses. This requires more faculty and graduate teaching assistants to be used for instruction, thereby potentially increasing total expenditures on instruction.

Approximately Two-Thirds of Increase in Instructional Spending Was Due to Enrollment Growth at Research Institutions

Between FY 2005 and FY 2012, the total number of student credit hours taught by Virginia's public four-year institutions increased by about 17 percent. Baccalaureate and master's institutions grew by 15 percent, while research institutions grew by 17 percent. The research institutions in Virginia are much larger than the other types of public institutions, so even though the enrollment growth rate was comparable at the other four-year schools, growth in student credit hours at research schools represented 72 percent of the total growth in instruction at Virginia's four-year colleges and universities (Figure 20). Nevertheless, when measured on a per student credit hour, inflation-adjusted basis, instructional spending slightly declined at Virginia's research institutions (Table 12).

A significant portion of the total increase in instructional expenditures at public four-year institutions in Virginia can be attributed to enrollment increases at research institutions. Between FY 2005 and FY 2012, after adjusting for inflation, total instructional

Figure 20: Research Institutions Accounted for 72 Percent of Statewide Instruction Growth (FY 2005–FY 2012)



Source: JLARC staff analysis of SCHEV student credit hour enrollment data.

Table 12: Inflation-Adjusted Change in Instructional Spending per Student Credit Hour was Higher at Non-Research Schools (FY 2005–FY 2012)

Institution	Inflation-adjusted change in expenditures per Student Credit Hour
LU	18.2%
RU	18.0
UVA-W	13.2
JMU	10.5
VSU	10.0
CNU	6.3
UMW	1.7
VMI	–5.8
Master's & baccalaureate institutions	**10.6%**
CWM	12.9
UVA	7.2
GMU	5.9
VT	–4.5
ODU	–9.8
VCU	–11.1
Research institutions	**–2.0%**

Note: Table does not include NSU; the institution had not completed its Audited Financial Statement for FY 2012.

Source: JLARC staff analysis of audited financial statements and SCHEV student credit hour data.

A substantial driver of the rising cost of higher education in Virginia has been that institutions with higher instructional costs are educating an increasingly greater percentage of students.

expenditures increased by $192.8 million at Virginia's four-year institutions (excluding VCU and NSU, for which complete data in both years were unavailable). Of this increase, $124.3 million (65 percent) can be attributed to the increase in student credit hours that occurred at Virginia's research institutions. A substantial driver, therefore, of the rising cost of higher education in Virginia has been that institutions with higher instructional costs are educating an increasingly greater percentage of students.

TREND TOWARD HIGHER COST STEM-H DISCIPLINES IS LIKELY TO CONTINUE

Increasing STEM-H enrollments is a focus of recent higher education policy in Virginia. While this focus is generally well-received by students, institutions, and employers, due to higher average instructional costs, increasing enrollment in STEM-H disciplines may increase the average cost of higher education instruction in Virginia.

STEM-H Disciplines Cost Substantially More to Provide

Academic disciplines classified as STEM-H tend to cost more to provide. For example, engineering costs, on average at research in-

stitutions, $457 per credit hour. Computer science costs $375 per credit hour. In contrast, English and psychology cost $223 and $183 per credit hour, respectively.

Overall, STEM-H disciplines assessed by JLARC staff were more costly to provide than non-STEM disciplines (Table 13). In FY 2012 STEM-H programs cost 35 percent more per student credit hour at master's and baccalaureate institutions, and seven percent more per student credit hour at research institutions.

Table 13: STEM-H Programs Have Higher Instructional Costs on Average Than Non-STEM Programs (FY 2012)

Institution type	STEM-H expenditures per SCH	Non-STEM-H expenditures per SCH
Master's & baccalaureate	$217	$161
Research	305	285

SCH = student credit hour

Source: JLARC staff analysis of instructional expenditures by discipline and SCHEV credit hour enrollment data.

Non-Personnel Expenditures Were Greater Driver of Instructional Expenditures in STEM-H Disciplines. Among research institutions in FY 2012, non-personnel expenditures were 11.0 percent of direct instructional expenditures in STEM-H fields, but 9.2 percent in non-STEM fields. At master's and baccalaureate schools, non-personnel expenditures were 10.1 percent of direct instructional expenditures in STEM-H disciplines, but only 5.6 percent in non-STEM disciplines.

In Certain STEM-H Disciplines, Faculty Compensation Is Substantially Higher. Full professors in STEM-H disciplines at research institutions had an average salary of $117,843 in FY 2012, approximately 16 percent higher than the average salary in non-STEM disciplines (excluding business). STEM-H faculty salaries at master's and baccalaureate institutions were 11 percent higher on average.

Specialized Accreditation for STEM-H and Other Disciplines Can Increase Costs. Instructional workloads can vary considerably by discipline, which can affect cost per student credit hour. Part of the differences in workload between disciplines may be related to accreditation. Staff at institutions indicated that accreditation for engineering programs is seen as necessary, as students who graduate from non-accredited academic programs have trouble competing in the job market.

Specialized accreditations are typically more prescriptive than institution-wide accreditation and have more stringent requirements regarding course of study, faculty qualification, faculty workload, and equipment and facilities, all factors that influence spending. Therefore, engineering and health professions, which are externally accredited, face similar cost structures at the undergraduate and graduate levels regardless of the Carnegie classification of the institution at which they are offered. As of 2012, all engineering and nursing programs at Virginia institutions had received specialized accreditation.

Instruction in STEM-H Disciplines Has Increased More Than in Other Disciplines

Not only has the majority of enrollment growth in Virginia occurred at more expensive research institutions, more instruction is being provided in more expensive academic disciplines. Between FY 2005 and FY 2012, all but three Virginia institutions experienced an increase in the proportion of their overall instruction occurring in STEM-H disciplines, which likely contributed substantially to the increase in total instructional expenditures over the period (Table 14). Statewide, the number of student credit hours

Table 14: STEM-H Instruction Increased at 12 of Virginia's 15 Four-Year Institutions Between FY 2005 and FY 2012

Institution	STEM-H instruction as portion of total instruction, 2005	STEM-H instruction as portion of total instruction, 2012	Trend 2005 to 2012
CNU	26.3%	27.4%	▲
JMU	22.0	27.3	▲
LU	18.6	20.9	▲
NSU	29.8	32.3	▲
RU	21.7	22.6	▲
UMW	23.3	22.5	▼
UVA-W	24.2	23.1	▼
VMI	37.0	38.2	▲
VSU	27.3	24.9	▼
Master's & baccalaureate	**23.9%**	**26.2%**	▲
GMU	17.8	20.4	▲
CWM	19.0	20.2	▲
ODU	30.4	32.6	▲
UVA	25.4	29.0	▲
VCU	27.3	30.3	▲
VT	42.2	45.4	▲
Research	**28.6%**	**31.2%**	▲
Statewide	**27.2%**	**29.8%**	▲

Source: JLARC staff analysis of SCHEV student credit hour enrollment data.

taught in STEM-H disciplines increased by 27 percent, faster than the 17 percent total increase in instruction. This increase in STEM-H instruction increased the STEM-H share of total instruction from 27 percent in FY 2005 to 30 percent in FY 2012. Changes in STEM-H instruction ranged from six to 14 percent increases at research institutions, and –9 percent to 24 percent at master's and baccalaureate institutions.

In addition to STEM-H, other high cost disciplines were among the fastest growing disciplines in Virginia between FY 2005 and FY 2012 (Table 15). Among the 10 fastest growing disciplines statewide, eight were found to be among the 10 most expensive to offer at master's and baccalaureate institutions, and seven were among the 10 most expensive to offer at research institutions.

Table 15: Many of the More Expensive Disciplines Were Among the Fastest Growing in Virginia

Master's & baccalaureate institutions	Research institutions
Engineering	Engineering
Health Professions	Computer Science
Physics	Health Professions
Computer Science	Physical Sciences
Arts	Physics
Physical Sciences	Arts
Biological Sciences	Biological Sciences
Chemistry	

Source: JLARC staff analysis of institutional expenditures data and SCHEV enrollments data.

Continued Emphasis on STEM-H Will Likely Continue to Increase Costs

While growth in STEM-H instruction relative to other disciplines was modest between FY 2005 and FY 2012, Virginia's continued policy emphasis on growing enrollments in STEM-H disciplines makes it likely that this gradual shift toward higher cost disciplines will continue. Approximately 1.4 percent of the increase in instructional costs between FY 2005 and FY 2012 at Virginia's public four-year institutions can be attributed to increased enrollments in STEM-H disciplines. While this cost impact was modest, continued growth in these programs' enrollments will continue to increase the average cost of instruction in Virginia.

The Higher Education Opportunity Act of 2011 provides incentive funding to institutions for meeting various goals, among them increasing enrollments in and offerings of STEM-H disciplines. While institutional staff indicated that the additional general fund support for efforts in STEM-H initiatives has been helpful, they state that the additional support has not covered the full cost of STEM-H initiatives. Staff also stated that although they support

STEM-H initiatives, the Higher Education Opportunity Act does not drive trends but follows pre-existing broad shifts in student enrollments and the employment market. Staff at one institution described the policy as "almost irrelevant," as their STEM-H focus and broadly increasing STEM-H enrollment existed before the policy was enacted.

While the policy does support general movement toward STEM-H and away from a concentration on liberal arts, it does not appear to provide guidance or incentives to focus on particular fields. This lack of guidance may have cost implications for the State and institutions, as not all STEM-H fields face similar levels of student or market demand, and the need to establish, expand, and operate different STEM-H programs varies greatly. In interviews, some institution staff indicated that the State's policy appears to disproportionately benefit those institutions with an existing STEM-H mission. Staff also predicted that increasing STEM-H offerings and enrollments will likely further increase the average cost of instruction across the State.

Chapter 6 Institutional Spending on Research Is Substantial

In Summary

In FY 2011, Virginia's six research institutions collectively spent $1.2 billion on research and development activities. The federal government is the largest source of funding for research activity at Virginia's institutions. This is consistent with national trends. While institutions receive large amounts of funding for research from external sponsors, institutions fund over one-fifth of research activity. Sponsored research results in unfunded costs to institutions in the form of required cost sharing and indirect facilities and administrative costs. Institutions also conduct research activity that is not externally funded. In FY 2011, research institutions covered nearly $300 million in research costs from a variety of institutional sources, including tuition and fees. However, although academic research costs institutions, it has benefits for students, and it increases employment and economic activity. Likely declines in the availability of federal research funding may increase the reliance on State funding and other funding sources. SCHEV should track research funding from all State sources, which is decentralized, and develop a process for institutions to report on the progress of State-supported research.

Research is a key mission of higher education institutions. *The 2007-13 Strategic Plan for Higher Education in Virginia* states,

> The research enterprise is in some respects the keystone of higher education. It is from research and scholarship that new knowledge is discovered. It is precisely in the area of research that it most difficult to achieve and maintain excellence. (SCHEV, 2013)

The Higher Education Opportunity Act also emphasizes the importance of research and includes the objective of promoting university-based research to, among other things, fuel economic advances and "place the Commonwealth on the leading edge in the knowledge-driven economy."

Virginia's six research institutions—VT, UVA, VCU, ODU, GMU, and CWM—make 98 percent of the total academic research and development (R&D) expenditures at public four-year institutions in Virginia. This chapter focuses on research activity at these six institutions.

INSTITUTIONS HAVE EXPANDED SCOPE AND SIZE OF SPONSORED ACTIVITIES

In FY 2011, Virginia's six research institutions collectively spent $1.2 billion on research and development activities (Table 16). VT,

UVA, and VCU had the greatest research expenditures, representing 85 percent of all expenditures by research schools. The three remaining research institutions had smaller, though still substantial, research expenditures that year.

Table 16: Total Research Expenditures at Virginia's Research Universities Increased by 62 Percent Between FY 2003 and FY 2011 ($ Millions)

Institution	Increase in research expenditures FY 2003–FY 2011	Total research expenditures FY 2011
VT	80.6%	$450.1
UVA	38.7	292.1
VCU	49.0	207.8
ODU	199.2	102.2
GMU	59.7	88.1
CWM/VIMS	14.7	58.9
Statewide	**62.1%**	**$1,199.1**

Note: Includes federal, private, state and local, and institutional funding sources.

Source: JLARC staff analysis of National Science Foundation data.

Research expenditures at Virginia's research institutions have grown substantially. Between FY 2003 and FY 2011, Virginia's six research institutions increased research spending by 62 percent. This is slightly higher than the 57 percent increase in higher education research expenditures nationwide. VT and ODU had increases greater than the state average, while UVA, VCU, GMU, and CWM increased research spending at a rate less than the state average.

Despite Spending Increases, Virginia's Rankings for Research Spending Are Relatively Low and Have Changed Little

Despite the increase in research spending at Virginia's institutions, Virginia's rankings in research spending were little changed between FY 2003 and FY 2011. Virginia's national ranking of 37th in academic research spending per capita in FY 2003 had not changed by FY 2011. Only VT and ODU rose in the research spending national ranking (Table 17). The rise in ranking was greatest at ODU, after it nearly tripled its research spending between 2003 and 2011. After an 80 percent increase in spending, VT rose in the national ranking for research spending. VCU remained the same and the other research institutions moved down.

Institutions Vary in Sources of Research Funding and Fields of Research Activity

Consistent with nationwide trends, federal funding accounted for the majority of research activity at Virginia institutions in FY 2011.

Table 17: VT and ODU Rose in National Rankings of Research Spending Between 2003 and 2011

Institution	National ranking, 2003	National ranking, 2011
VT	54	41
UVA	66	72
VCU	98	98
ODU	189	146
GMU	148	156
CWM	156	186

Note: NSF provided rankings for top 200 institutions in terms of research expenditures.

Source: JLARC staff analysis of NSF data.

Statewide, federal funding represented 59 percent of research expenditures at research institutions (Table 18). Federal support was highest at UVA, VCU, and GMU. Federal support was a lower portion of research expenditures at CWM, VT, and ODU, but still represented a substantial source of funding for those institutions.

Other primary sources of research support were institutional funds and funding provided by State and local governments. Institutional funds represented 21 percent of total research expenditures in FY 2011, ranging from 9 percent at UVA to 53 percent at ODU. State and local support was the third largest source of research funding, supporting 11 percent of research expenditures at the six institutions in FY 2011. The bulk of state and local funds were spent at VT, due in large part to historical state support for its agricultural mission.

Table 18: Federal Funding Was Primary Source of Research Expenditures at Virginia's Research Institutions in FY 2011

Institution	Federal government	State and local government	Institutional funds*	Business	Nonprofit organizations	All other sources
VT	42%	24%	24%	5%	4%	1%
UVA	80	<1	9	5	5	1
VCU	74	5	15	4	3	0
ODU	39	4	53	2	2	<1
GMU	74	2	18	1	5	<1
CWM/VIMS	52	4	36	5	4	0
Statewide	**59%**	**11%**	**21%**	**4%**	**4%**	**<1%**

Note: Institutional funds come from a variety of sources including unrestricted general funds, recovered indirect funds from grant sponsors, and tuition and fees.

Source: JLARC staff analysis of NSF data.

Institutions vary greatly in the research disciplines in which they specialize. In FY 2011, 47 percent of all research expenditures at Virginia's research institutions were in the life sciences, such as genetics and bioinformatics. The majority of research activity at UVA (68 percent) and VCU (71 percent) was in life sciences, representing the high level of research activity at their medical schools. VT also had substantial expenditures in life sciences disciplines, representing 41 percent of that institution's research activity. Engineering represented 24 percent of activity statewide and was a substantial portion of the research activity taking place at VT (43 percent) and ODU (32 percent). Physical sciences, environmental sciences, and the social sciences were also substantial areas of research at Virginia's institutions.

INSTITUTIONS FUNDED NEARLY $300 MILLION IN RESEARCH COSTS

The majority of academic research activity in Virginia is funded by external sponsors, such as the federal government. Institutions fund 21 percent of academic research activity (Table 18). In 2011, institutional funds ranged from nine percent of research spending at UVA to 53 percent of research spending at ODU. Institutional funds are used to support research for two reasons. First, funding provided by sponsors often does not cover the full costs of research projects. Second, institutions support research-related activities and efforts that do not receive external funding. In FY 2011, Virginia's research institutions paid nearly $300 million in research costs. Institutional research costs are funded through a variety of sources, including tuition and fees paid by students.

Although Sponsored Research Brings in Large Amounts of Funding, It Also Raises Costs for Institutions

Funding provided by external research sponsors is typically considered financial assistance and often does not cover the full direct and indirect costs of sponsored research projects. As a result, institutions must frequently pay a portion of the cost of sponsored projects, primarily through cost sharing and unrecovered facilities and administrative (F&A) costs. These costs can be significant and ranged from approximately $4 million at GMU in FY 2011 to over $35 million at VT in FY 2012 (Table 19). Research institutions spent a total of $95.6 million on these costs in FY 2012.

Table 19: Total Unfunded Cost Related to Sponsored Research Was Approximately $95.6 Million in FY 2012

	FY 2011			FY 2012		
Institution	Total costs ($ Millions)	Cost share as % of total	Unrecovered F&A as % of total	Total costs ($ Millions)	Cost share as % of total	Unrecovered F&A as % of total
VT	$34.2	12.7%	87.3%	$35.1	20.1%	79.9%
UVA	23.6	14.9	85.1	24.6	13.2	86.8
ODU	16.2	10.9	89.1	15.8	10.8	89.2
CWM	7.1	18.5	81.5	6.4	18.2	81.8
VCU	8.0	12.6	87.4	8.0	15.9	84.1
GMU	4.0	23.4	76.6	5.7	28.2	71.8
Total	**93.1**	**13.8**	**86.2**	**95.6**	**16.8**	**83.2**

Source: JLARC staff analysis of data provided by institutions.

Research Sponsors May Require Institutions to Share in Direct Cost of Funded Research Through a Cost Share. Direct costs are those costs that can be readily identified with a particular research project. Examples of direct costs include faculty salaries, chemicals for a specific experiment, or the salaries of laboratory technicians who work on a specific sponsored project. A "cost share" is the portion of the direct project costs that is not borne by the sponsor.

Faculty Time Charged to External Grants

When a faculty member receives an external research grant, the portion of that faculty member's time that is spent on the research project is charged to the grant.

For example, a faculty member making a base salary of $100,000 and spending 40% of her time on a sponsored research project would charge $40,000 to the grant. The remaining $60,000 of her salary would be covered by the institution.

Some institutions differentiate between a cost match and a cost share. "Cost matching" involves a financial contribution specifically appropriated by an institution for the project. For example, certain National Science Foundation (NSF) grants require a 30 percent cost match. "Cost sharing" typically represents in-kind contributions, such as a faculty or staff member's time or donated equipment. Salary caps imposed by some federal agencies also result in a cost share for institutions. For instance, National Institutes of Health (NIH) grants only recognize faculty salaries up to a certain limit. When charging a faculty member's time to an NIH grant, grant amounts must be based on salaries of $179,700 or less. For faculty members with base salaries over the cap, institutions must make up 100 percent of the salary difference.

Indirect Facilities and Administrative (F&A) Costs Are Not Fully Recovered From Research Sponsors. While direct costs can be readily identified with a particular project, research also results in indirect facilities and administrative costs, which are not as easily allocated to a specific project. F&A costs include items such as building operating costs, utilities, administrative offices coordinating sponsored research, and library costs. While not directly allocated to a specific project, F&A costs are higher at institutions as a result of sponsored activity. The 2008 Council on Government Relations report on the *Finances of Research Universities* acknowledged that "F&A costs incurred by universities are real costs of doing research." Thus, in accordance with regulations promulgated

by the federal Office of Management and Budget (OMB), institutions are permitted to try to recover F&A costs from research sponsors based on a federally negotiated F&A rate that is applied to all sponsored projects.

Calculation of F&A Reimbursement

The federal government establishes how F&A reimbursement is to be calculated and defines the allowable F&A costs and direct sponsored research costs. F&A costs are compared to the direct cost of sponsored research to arrive at an F&A reimbursement rate, which is negotiated with designated federal agencies. (See Circular A-21, Office of Management and Budget.)

Institutions do not recover their full F&A costs. The F&A recovery rates for Virginia's six research institutions are calculated by comparing the uncapped (or full) F&A amounts for sponsored research funding to the F&A amounts that they actually recovered from grant sponsors. Institutions' recovery of F&A costs from all sources ranged from 83 percent at GMU in FY 2011 to 37 percent at ODU in FY 2011 and FY 2012 (Table 20).

There are a number of reasons why institutions do not recover the full F&A costs associated with sponsored projects. A primary reason reported by Virginia institutions is a federally imposed 26 percent cap on the administrative portion of indirect costs. In 1991, the U.S. Congress limited the administrative portion of F&A costs so that it can be no more than 26 percent of allowable direct project costs. However, most Virginia institutions report that their administrative costs are closer to 30 percent of direct project costs, which is consistent with administrative costs reported nationwide.

Institutions also report that many sponsors do not reimburse full F&A amounts. Private industry and foundations often provide F&A reimbursement significantly below the federally negotiated rate. These organizations frequently indicate that their intention is to help support specific programs but not to pay all of the costs of a project. Certain federal agencies, such as the U.S. Department of Agriculture and the U.S. Department of Education, also reimburse below the full negotiated rate. For institutions that receive large amounts of funding from these sources, such as VT and ODU, this significantly diminishes overall F&A recovery. As reported by institutions, state government typically does not fully reimburse F&A costs, further exacerbating the problem of F&A underrecovery.

Table 20: Institutions Do Not Cover Full Calculated F&A Amounts

	FY 2011 Recovery rates		FY 2012 Recovery rates	
Institution	Total external sources	State sources[a]	Total external sources	State sources
ODU	37%	19%	37%	18%
CWM	56	46	60	39
VT	59	18	63	15
UVA	77	34	75	85
VCU	82	24	81	24
GMU	83	30	79	26

Note: State sources include funding provided by Virginia agencies and agencies in other states.

Source: JLARC staff analysis of data provided by institutions.

Institutions Pay Costs for Research That Is Not Externally Funded

Institutional Spending on Research at Virginia Tech

Officials at VT indicate that the relatively high amount of institutional spending on research reflects, in part, VT's strategy to create research institutes to accelerate research growth in targeted areas such as bioinformatics, transportation, and biomedical and health sciences. These institutes require an investment of institutional funds but also enhance VT's ability to maximize external funding and bring new opportunities to the institution.

In addition to the costs related to sponsored research, institutions support research efforts that are not externally funded. In FY 2011, institutionally financed R&D ranged from an estimated $3.7 million at UVA to $114.1 million at VT (Table 21). In total, research institutions spent over $200 million in FY 2011 on research that is not externally funded.

Table 21: Institutions Spent an Estimated $204.5 Million for Research and Development in FY 2011

Institution	Institutional Spending ($ Millions)
VT	$114.1
ODU	38.3
VCU	22.1
CWM	14.2
GMU	12.1
UVA	3.7
Total	**204.5**

Note: Does not include departmental research that is not separately budgeted. Does not include cost share and unrecovered F&A amounts related to sponsored research. VT amounts do not include $37.5 million in unrestricted E&G funds provided for its agricultural experiment station.

Source: JLARC staff analysis of data from the National Science Foundation Higher Education Research and Development Survey (FY 2011) and Virginia institutions.

Institutions Provide Funding For Emerging and Ongoing Research. Institutions report that they provide research funding for a variety of purposes. For instance, institutions provide awards and seed money to support emerging research efforts of faculty that have not yet received external funding. Institutions may provide bridge funding for faculty members who are between research grants so that their research projects can be continued. Institutions sometimes also supplement the salaries of faculty who are involved in research.

Institutions Frequently Offer Start-up Packages to Attract Research Faculty. Virginia institutions do not centrally track start-up packages, so the total amount spent by institutions for this purpose is unknown. However, institutional staff indicate that the frequency and size of start-up packages have grown over the past decade.

Start-up packages can have multiple components and frequently span the first three years of employment. Typical items include the construction and renovation of laboratories; materials and equipment; support for laboratory staff, graduate assistants, and post-doctoral fellows; for faculty, summer salaries, reduced teaching

loads, travel money, and salary bonuses; and unrestricted research funds. The case studies that follow illustrate two recent start-up packages for newly-hired faculty at GMU.

Case Study: Examples of Start-Up Packages

A chemistry tenure-track faculty member received general start-up funds ranging from $130,000 to $50,000 in each of the first three years of employment. This faculty member was not required to teach any courses during the second year, and received access to the university's spectrometer and dedicated lab space.

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An engineering tenure-track faculty member received $95,000 in general start-up funds to be spent over the first two years of employment. This faculty member also received funding to pay two graduate research assistants, and summer salary for the first two years. Teaching loads were reduced to between one and three courses per year for the first three years.

The size of start-up packages varies significantly by discipline and institution. Start-up packages are largest in science and engineering disciplines where infrastructure requirements are more costly and there is stronger competition for faculty who may ultimately bring in external funding. At the high end, staff from UVA indicate that start-up packages for a senior scientist can be as high as $7 million. Staff at VT and VCU reported start-up packages as high as $1 million in the areas of biomedical sciences and chemistry. Average start-up packages in science and engineering reported across the six research institutions ranged from $200,000 to $900,000. Institutions reported much smaller start-up packages in the arts and humanities, ranging from $10,000 to $65,000.

Institutions indicate that start-up packages can yield a positive return on investment for the institution. For example, a researcher in the college of agriculture and sciences at VT received a start-up package of $300,000 in 2010. As of 2013, this researcher had generated $1.1 million in external research funding and $340,000 in F&A resources, delivered seven peer-reviewed publications, and had one patent pending. However, the research literature on start-up packages has also shown that it typically takes several years for new faculty members to obtain external funding. As stated by VT, "Start-up support is intended to help the faculty member become successfully established … until externally funded sponsored projects can be obtained by the faculty." In the meantime, institutions must cover the costs of the start-up packages.

Further, not all faculty members generate a positive return on investment. In a 2013 VCU review of nine faculty members who had received start-up packages in the 2006 through 2008 time frame, one member had not generated a positive return and one other had only generated a small one. Also, institutions report that faculty members who have received large start-up packages sometimes leave before their work has generated a positive return.

Reduced Teaching Loads for Research-Active Faculty Increase Costs. Faculty members may receive "reassigned time," which reduces their teaching loads and allows them to spend more time on research. For faculty with sponsored funding, the external funds cover their reassigned time, freeing up institutional funds to pay other faculty to teach their courses. Institutions may also allow reassigned time for faculty members who do not have external funding sources. This increases costs to the institution because additional faculty are needed to teach the load no longer taught by the research faculty.

Virginia institutions indicated that policies for reassigned time are generally established and tracked at the departmental level, so the extent to which they are used institution-wide is unknown. However, their use likely varies by institution. For instance, CWM rarely uses faculty reassigned time.

Institutional Research Costs Are Covered by a Variety of Sources, Including Tuition and Fees

The impact of academic research on student tuition and fees has been a substantial topic of interest in the higher education research literature. Students bear a portion of the costs related to research, but tuition and fees are only one of the sources used by institutions to cover these costs. Additional sources include unrestricted endowment funds and other sources of private funding, facilities and administrative costs that are recovered from grant sponsors, revenue streams that institutions develop from the commercialization of faculty research, and unrestricted state general funds.

Indirect Facilities and Administrative Cost Recoveries

The Appropriation Act allows institutions to use 70 percent of recovered indirect facilities and administrative costs at the 2003 level, and 100 percent of indirect cost recoveries above the 2003 level for research-related requirements. This provision is intended as an incentive to increase externally funded research.

Unrecovered Costs Related to Sponsored Research Are Covered by Tuition and Fees, to Some Extent. Virginia institutions indicate that, because unrecovered F&A and sharing costs for sponsored research are largely absorbed by the institutional functions where the costs occur, it is difficult to identify their funding source. Due to the various sources of funding described above and the financial situations at different institutions, the funding source for these costs will vary. Precise data on the level of tuition and fees funding unrecovered costs is not available. However, it is possible

that the tuition and fee impact could be up to several hundred dollars per student at some institutions.

As previously indicated, the State contributes to the problem of F&A underrecovery for institutions. If the State were to pay F&A costs at the full negotiated rate, the potential tuition and fee impact could be reduced. This is particularly the case at institutions that reported significant underrecovery associated with State funds, such as ODU and VT. Covering full F&A costs would be consistent with a 2012 report by the National Academy of Sciences, which recommended that "the federal government and other research sponsors should strive to support the full cost, direct and indirect, of research and other activities they procure from research universities so that it is no longer necessary to subsidize these sponsored grants by allocating resources (e.g., undergraduate tuition and patient fees for clinical care) away from other important university missions."

Institutionally Financed Research May Be Funded by Tuition and Fees, To Some Extent. As described previously, institutions support research efforts that are not externally funded. These efforts are also likely supported, at least partially, by tuition and fees. In 1997, the National Science Foundation (NSF) reported that

> universities may pay for these "own" research expenditures … from a research account or from any of their unrestricted funds accounts: revenue from state sources, industry, private donors, educational sales and services, auxiliary enterprises such as campus stores, etc., and tuition. Thus, a subsidy of research by tuition cannot be ruled out. (NSF Issue Brief 97-313, July 18, 1997)

Information provided by Virginia's research institutions supports the NSF findings that a multitude of sources are used to support institutional research, including tuition and fees. Detailed fund source data was not provided by Virginia institutions. However, in addition to those sources identified by NSF, Virginia institutions listed recovered F&A amounts and the Higher Education Equipment Trust Fund as sources of funds supporting institutional research.

HIGHER EDUCATION RESEARCH BENEFITS STUDENTS, THE STATE, AND INSTITUTIONS

Although academic research costs institutions and students, it also provides benefits. The link between higher education research and its benefits to students, institutions, and the economy is a much-studied phenomenon. In general, literature indicates that academic research has positive benefits for students, is the primary means of increasing an institutions' prestige, and has positive impacts on economic growth.

Undergraduate and Graduate Students Benefit from Higher Education Research Activity

The literature indicates that the primary benefit to undergraduate students engaged in research is gaining hands-on experience with the research process and a more nuanced understanding of scientific methods. Studies indicate that students engaged in research gain cognitive skills. Participation in research allows undergraduates to gain professional experience and confidence and to improve academic performance. Several studies also found that students engaged in research as undergraduates were more likely to complete their degree on time and pursue post-graduate education. The benefits of having faculty engaged in research activities affects graduate-level instruction, as most graduate students are engaged in some level of research through their course of study.

Several of Virginia's institutions identified recent efforts to support and increase undergraduate research opportunities. As part of its Quality Enhancement Plan, CWM took a two-pronged approach to integrating research experience with undergraduate education. First, faculty were provided with support and resources to increase the amount of research activity across the undergraduate curriculum. Second, between 2007 and 2011, CWM provided funding for more than 90 individual undergraduate research projects. JMU reported participation in the NSF's Research Experiences for Undergraduates programs, which provided support for students to participate in research activities in chemistry, materials science, mathematics, and biology.

Staff at several Virginia institutions stated that more productive researchers tended to be more effective instructors. However, studies in the previous decade have found no statistically significant relationship between faculty research productivity and teaching effectiveness. Research and instruction appear to be separate competencies, and high performance in one does not necessarily correlate with high levels of accomplishment in the other. As one study indicates, the primary goal of research is to advance knowledge, while that of teaching is to develop and enhance students' abilities. Further, even if research and teaching effectiveness were related, faculty engaged in research activities spend less time on instruction than faculty with less of a focus on research.

Higher Education Research Increases Employment and Economic Activity

Institutional staff, experts, and literature indicate that higher education research activities provide several direct and indirect benefits to local, regional, and state economies. When research activities are supported by funds from outside the state, such expenditures represent a direct increase in a state's economic activity.

Salter and Martin (2001) indicate that while varying by institution and field of inquiry, there are positive private and public returns to investment in higher education research. Martin and Tang (2007) confirm this, showing that over several decades numerous studies have found positive rates of return to public investment in research. They indicate that findings from research also create spillover effects that drive economic development and employment in the localities in which research institutions are located. McMillan and Hamilton (2002) found that three-quarters of industrial patents cite findings that resulted from publicly-funded research.

Institutions and experts indicate that increases in direct and indirect employment related to higher education research may also lead to "agglomeration" impacts. Clustering of individuals who are involved in research may increase activities in the local economy. Spin-offs, start-ups, and relocations may occur as companies seek the advantages of proximity to a research institution: access to human capital, facilities, and technology.

Several Virginia institutions have assessed the relationship between their research activities and economic benefits. In general, the economic benefits from research come primarily from salaries for faculty and staff engaged in research activities, student and staff spending, and institutional spending on facilities, equipment, and supplies. A study conducted for CWM by the Virginia Innovation Partnership concluded that the direct gains to local economies were $4 for every $1 received from state sources at a public institution.

A 2011 study conducted by the Weldon Cooper Center for Public Service found that research activities at the University of Virginia Cancer Center generated substantial economic returns. Analysis of the Cancer Center's research activity found that it supported at least 1,500 jobs, generated $127.4 million in output and $77.8 million in GDP, and increased state tax revenues by $8.6 million. A 2012 STAR METRICS report assessing research activity at UVA found that federally-sponsored research activities generated spending in 53 Virginia localities, and approximately 2,500 jobs in activities directly related to research, institutional support for the research mission, and vendors providing goods and services related to research activities.

Research Increases Institutional Prestige

Institutional staff and experts indicate that institutional prestige is most directly related to the size, quality, and productivity of its research missions. The most direct way for an institution to improve its reputation is to invest in and cultivate the growth of its research activities.

In interviews, institutional staff indicate that an active and growing research mission allows institutions to recruit more highly qualified students and productive research faculty. They indicate that students are attracted to opportunities to participate in research, and literature indicates that the perceived prestige of an institution is a strong factor in students choosing which schools to attend. Increased amounts of faculty research increases the opportunities to engage in faculty-led research, and also provides equipment and facilities that can be used to support the institutions' instructional missions.

Institutions also indicate that faculty want to work at institutions with other research faculty (particularly faculty with similar or related research interests) and at institutions that actively demonstrate support for faculty research activities. Increased quality of faculty research opportunities allows institutions to cultivate spin-off research businesses and provides the opportunity for patentable findings that may contribute to institutional revenues.

LIKELY DECLINE IN FUNDING AVAILABILITY WILL INCREASE IMPORTANCE OF TRACKING STATE FUNDING AND PROGRESS

Because of the importance of academic research at public institutions, the State government has taken a role in supporting academic research activity. This role is likely to become more important as the funding environment for academic research becomes more competitive. Federal support for academic research, in particular, is projected to decline in part due to federal sequestration. According to a July 2013 letter from the SCHEV director, the bulk of sequester-related higher education cuts will occur in federal support for academic R&D. SCHEV projects a reduction in federally-funded academic research in Virginia of between $34 million and $50 million in FY 2014. The State cannot be expected to fill the funding gap, but State support will become an increasingly important source of research funding.

Chapter 1 described how state support for academic research in Virginia has lacked continuity in both strategy and funding. This may be partly related to the relatively decentralized governance structure for higher education in Virginia. Even in the absence of a defined strategy for funding academic research, State funding for research could be better identified, tracked, and monitored. No state entity currently tracks State funding for academic research or the outcomes of state-supported projects. This makes it very difficult to determine specific levels of State support provided to different institutions over time and whether State funds have been used effectively.

Establishing responsibility in SCHEV to formally track State support for academic research from all sources (including general fund appropriations, the HEETF, and the CRCF) and develop a procedure for institutions to report on the progress of State-supported research would assist with this process. This could include creating a statewide system to allow institutions to submit research-related data. SCHEV could also assist institutions with keeping abreast of funding opportunities at the federal level. These steps would better position the State to develop a stronger strategy for State-supported academic research in the future.

Recommendation (5). The General Assembly may wish to consider amending the Code of Virginia to direct the State Council of Higher Education for Virginia to track State funding for higher education research from all sources and develop a process for institutions to report on the progress of State-supported research projects.

Chapter 7

Institutions Have Spent Substantially to Increase Instructional and Research Space

In Summary

State policy on capital planning for higher education has not been consistently complied with, resulting in allocations for projects potentially not justified by institutional needs. Not following the established capital planning processes has coincided with substantial expenditures on construction ($2.5 billion) and renovation ($901 million) of instructional and research space. Virginia's public institutions substantially increased instructional and research space between FY 2005 and FY 2012, even when adjusted for growth in enrollment and research spending. Following established capital processes in the future will be important given institutions' recent six-year capital plans, which collectively requested $6.5 billion in State-supported capital projects for FY 2014 through FY 2020. While many institutions have had low classroom utilization rates over the past decade according to SCHEV's guidelines, most institutions appear to require additional research square footage. Because the guidelines are out-of-date and do not accurately reflect space usage, it is difficult to assess the extent to which institutions have constructed more space than needed. SCHEV should improve its instructional and research space guidelines to measure current institutional use and better assess the need for additional capital spending.

Instructional Space

Includes space used primarily for general academic instruction and other types of instruction (such as remedial instruction). It also includes academic support space, such as for academic computing services, academic administration, and course and curriculum development.

Research Space

Includes space used primarily to perform activities specifically organized to produce research outcomes, including institute and research centers and individual and project research.

HJR 108 (2012) directs JLARC staff to consider the design and utilization of facilities. Typically, higher education facilities are mixed-use, with a variety of space dedicated to instruction, research, administrative offices, and other space. The construction, renovation, and operation and maintenance (O&M) of instructional and research space have costs shared by the State, institutions, and students. Facilities are funded through a combination of State and institutional debt, general fund support, and institutional revenues, including tuition and fees.

The 2013 JLARC *Review of Non-Academic Services and Costs at Virginia's Public Higher Education Institutions* found that institutional spending on non-academic capital projects increased considerably in recent years. This resulted in a substantial increase in the cost of higher education. That review found that, on average, seven percent of the price of higher education to students was to pay for institutional debt service, primarily on non-academic capital projects.

Virginia's institutions also have substantial capital needs to support their instructional and research missions. This chapter addresses capital spending for facilities that include instructional or research space.

PLANNING PROCESS IS NOT FOLLOWED AND SOME APPROVAL DECISIONS ARE NOT CONSISTENT WITH SCHEV PRIORITIZATIONS

The Code of Virginia and Appropriation Act establish a six-year capital planning process for State capital budgeting. Since 2008, the process has included a number of key entities in the executive and legislative branches, including the Six Year Capital Outlay Planning Advisory Committee (6PAC). The 6PAC is composed of the Secretary of Finance, the directors of the Department of Planning and Budget and Department of General Services, and the staff directors of the House Appropriations and Senate Finance Committees. (Appendix F includes more detail about the capital project approval and funding process.)

The State's Planning Policy for Capital Projects Has Not Been Consistently Followed

The capital planning process as established in Code and the Appropriation Act has not been strictly adhered to since its adoption in 2008. The first deviation came in the 2009 special session, during which a list of projects supported by institutions and submitted by the governor were adopted in the State's six-year capital outlay plan without going through the capital planning process as statutorily required. Projects were authorized to use debt resources that had not progressed through pre-planning and detailed planning and had unverified cost estimates. For example, VSU received authorization for $87 million to construct a convocation center. The authorization was substantially larger than the initial cost estimate of the project ($36 million), and the project was no longer going to receive the more than $20 million in private funding that was initially proposed. Further, the $87 million authorized was not based on detailed planning estimates, and the project had not been subject to value engineering.

After 2009, executive and legislative staff indicate that for several years the 6PAC did not meet regularly enough to effectively make recommendations regarding capital outlay plans or to oversee the process as envisioned in the Code. This limited the ability of stakeholders to ensure projects met programmatic needs, had appropriate plans and scope, had detailed plans, and were funded in accordance with their authorized budgets. Staff indicate that reforms adopted during the 2013 General Assembly session should address this issue, as 6PAC is now required to meet quarterly.

Not adhering to the capital process creates several issues. First, according to stakeholders, many projects receive funding in an effort to ensure that each institution receives some amount of authorization for capital projects. This means that some projects may

go unfunded, even though they demonstrate greater need, as lower-priority projects are funded due to a perceived need to ensure that each institution receives funding for at least one requested project.

Second, according to stakeholders, the lack of a consistent and steady approach to funding capital projects creates a "mob effect" in which institutions are incentivized to advocate for lower-priority or insufficiently planned projects because they are uncertain when their capital needs will be addressed in the future. The State has passed substantial capital outlay authorizations on four occasions in the previous two decades: 1992, 2002, 2009, and 2013.

Third, the length of time between substantial outlays creates capital backlogs, which delay the ability of institutions to construct facilities with completed detailed plans. Delays lead to "stale" plans, in which cost estimates become outdated due to inflation and other factors.

SCHEV's Prioritization Process Could Be Relied Upon More in Determining Which Projects Receive Funding

SCHEV's prioritization process could also be relied upon more for capital funding decisions. The Code of Virginia requires SCHEV to "develop policies, formulae and guidelines for the fair and equitable distribution and use of public funds among the public institutions of higher education … [that] shall include provisions for operating expenses and capital outlay programs" (§ 23-9.9). In response to this requirement, SCHEV staff assign priority levels to proposed instructional and research construction and renovation projects and make capital outlay recommendations to 6PAC based on these priority levels.

SCHEV staff use three criteria—common to both instructional and research facilities—to evaluate construction and renovation projects that institutions propose in their six-year capital plans:

1. *Whether the additional space is currently justified based on space need guidelines*. SCHEV maintains space need guidelines, which are applied across an institution's total instructional or research square footage. SCHEV's guideline for instructional and academic support space recommends between 42.5 and 50 assignable square feet (ASF) per current student FTE enrolled during the academic year, depending on an institution's programs and disciplines. SCHEV's guideline for research space is based on measures of financial productivity and provides recommendations based on the varying needs of different academic disciplines.

2. *Whether the space is justified during the fourth year of an institution's six-year capital outlay plan*. This metric is used to assess the need for additional space from construction projects, since capital projects take several years to move from design to completion. Additional space is justified through the space need guidelines using projected student enrollments.

3. *Whether a compelling programmatic justification exists*. SCHEV staff use eight metrics to determine whether a project meets the criteria, including reasonable exceptions for projects that may be warranted even if an institution cannot justify the additional space. For example, a project may be recommended if it addresses life or safety issues (such as building accessibility for the disabled), meets the needs of a specific academic program (either due to unique space requirements or specialized accreditation requirements), or advances a specific priority of the State, such as a focus on replacing or renovating aging facilities.

SCHEV also uses a fourth metric to evaluate the need for additional instructional space:

4. *Whether the institution meets space utilization guidelines*. These guidelines measure how efficiently institutions use existing classroom and classroom laboratory space, as discussed in the next section.

After applying these criteria to projects that institutions proposed in their six-year capital plans, SCHEV staff identify institutional need for additional or renovated space and assign a priority level to capital projects. Priority levels range from 1.A to 4, and funding is recommended for projects that receive a priority level of 1.A or 1.B (Table 22).

SCHEV prioritizes higher education capital projects and accounts for projects that can only be justified for programmatic reasons. However, this prioritization does not appear to be a major factor in the State's capital process. Not following the State process and limited use of SCHEV's prioritization process leads to institutions receiving funding to construct and renovate instructional and research facilities that may not meet a critical State need or receive a high priority ranking. In institutions' FY 2014–FY 2020 six-year capital plans, 39 percent of general funds requested were for projects prioritized as Priority 1.A or 1.B. However, 61 percent of general funds requested were for lower priority projects (Priority 2–4) that do not meet one or more of SCHEV's prioritization criteria and for which SCHEV does not recommend funding.

Table 22: SCHEV's Priority Groups Are Primarily Assigned on the Basis of Established Metrics But Also Allow Consideration of Critical State Needs

Priority level	Description	Funding recommended?
1.A	Projects are fully justified under SCHEV's Fixed Asset guidelines or are considered critical to supporting the capital outlay needs of institutions	✓
1.B	Projects address critical statewide capital outlay needs and meet either the space need or space utilization criteria	✓
2	Projects that meet either the space need or the space utilization criteria	
3	Projects that do not meet the space need and space utilization criteria but which have a compelling programmatic justification	
4	Projects for which SCHEV does not currently have guidelines for evaluation and are deferred for further study	

Source: Prioritization process information from SCHEV's September 2013 meeting agenda and documentation provided by SCHEV.

INSTITUTIONS SPENT $3.4 BILLION ON CONSTRUCTION AND RENOVATION OF INSTRUCTIONAL AND RESEARCH SPACE

According to SCHEV staff, E&G facilities at Virginia's public four-year institutions have a replacement value of $8.4 billion. Substantial institutional capital spending has been initiated outside the State's capital planning process, at least in part to accommodate enrollment growth and changing academic and research needs. Because the space need guidelines are out-of-date or not used, projects have received capital authorizations without first being assessed using the objective criteria and processes outlined in policy, and may not have been justifiable based upon institutional need. A consistent and objective capital budgeting process should be followed, given the substantial capital funding requested by institutions in their recently submitted six-year capital outlay plans. For the FY 2014–FY 2020 period, Virginia's public four-year institutions have requested $6.5 billion in general funds for E&G facilities, including $2.6 billion in general fund supported projects identified as Priority 1.A or 1.B by SCHEV staff.

Most Schools Have Increased Instructional Square Footage per Student

In FY 2012, Virginia's four-year institutions collectively reported 9.2 million square feet of instructional space, a 22 percent increase over the total reported for FY 2005. Master's and baccalaureate institutions had an average of 54 square feet of instructional space

Table 23: Total Instructional Square Feet by Institution, FY 2012

Institution	Total instructional square feet	Instructional square feet per FTE student
CNU	199,704	41
JMU	850,340	44
LU	281,377	61
NSU	412,523	69
RU	405,894	44
UMW	293,583	64
UVA-Wise	190,714	109
VSU	299,095	52
VMI	176,278	96
Master's & baccalaureate Institutions	**3,109,508**	**54**
CWM	432,230	53
GMU	888,805	33
ODU	684,593	34
UVA	1,476,783	62
VCU	1,325,118	46
VT	1,306,680	42
Research institutions	**6,114,209**	**44**

Source: JLARC staff analysis of institutional data.

in FY 2012, ranging from 41 square feet per student at CNU to 109 square feet per student at UVA-Wise. Research institutions had an average of 44 instructional square feet per student, with a low of 33 square feet per student at GMU to a high of 62 square feet per student at UVA (Table 23).

Of Virginia's 15 institutions, 12 increased their instructional space per student between FY 2005 and FY 2012. The six research institutions collectively increased instructional square footage per student by four percent. Changes ranged from a 10 percent decline at VCU to an 18 percent increase at UVA.

Master's and baccalaureate institutions experienced a collective 7.4 percent increase in instructional square feet per student. Changes ranged from a 15 percent decline at NSU to a 20 percent increase at VSU (Table 24).

Some Institutions Cite Large Enrollment Growth and Space Shortage Prior to FY 2005. Enrollments increased substantially across Virginia between FY 2005 and FY 2012 and required investment in expanded instructional space. Four schools (ODU, VCU, JMU, and VT) identified large growth in enrollments as the primary factor contributing to their space increases. Several institutions noted that even before FY 2005 they were experiencing a shortage of instructional space per student. Assuming Virginia institutions had held their instructional square footage per student

Table 24: Most Institutions Increased Their Instructional Square Feet per Student (FY 2005–FY 2012)

Institution	Change in instructional square feet per student
CNU	0.5%
JMU	16.0
LU	3.5
NSU	–15.0
RU	23.0
UMW	9.0
UVA-Wise	8.0
VMI	–2.0
VSU	20.0
Master's & baccalaureate institutions	**7.4%**
CWM	13.0
GMU	7.0
ODU	9.0
UVA	18.0
VCU	–10.0
VT	3.0
Research institutions	**4.0%**

Note: VCU data reflect changes between FY 2008 and FY 2012.

Source: JLARC staff analysis of institutional square footage data and SCHEV student FTE enrollment data.

constant between FY 2005 and FY 2012, building simply to match enrollment growth would have resulted in 450,000 fewer square feet of instructional space than was actually built.

Some Institutions Cite Programmatic and Instructional Needs. Several institutions cited programmatic needs as the basis for increasing their instructional square footage. Programmatic changes can include changes within disciplines that require new types of space and changes in discipline offerings. For example, VCU had substantial construction to meet space needs related to expanded instruction in engineering. CWM was required to construct a new facility to house its education school, because the specialized accreditor found the existing facilities to be inadequate.

Institutional staff and literature indicate that instructional needs have changed, which requires new construction, renovation, and expansion of existing facilities. Several institutions indicated that changes in pedagogy and the increased use of technology in the classroom requires that new buildings contain more instructional space per student to accommodate new teaching modalities. For example, several institutions identified the need to accommodate

the increased use of small group work in the classroom as a contributor to increased space needed per student.

Research Institutions Increased Research Square Footage per $1 Million in Research Activity by 17 Percent

Virginia's six research institutions collectively have a substantial research mission and have made considerable investments in research space. In FY 2012, the research institutions represented approximately 96 percent of all research activity and research square footage in the State. Virginia's research institutions vary in the amount of research space they have, reflecting the scope of their research activities and mix of research activities in more and less space-intensive disciplines. Normalized square footage also reflects this diversity. Overall, in FY 2012 Virginia's research institutions ranged from a low of 2,161 square feet of research space per $1 million in research activity at ODU, to a high of 5,456 at UVA (Table 25).

Normalization of Research Space

Research space was normalized and reported in number of research square feet per $1 million of research activity. This was done to reflect the financial productivity of research space.

Table 25: Research Institutions Vary in Research Square Footage (FY 2012)

Institution	Total research square feet	Research square feet per $1 million in research activity
ODU	209,251	2,161
VT	741,299	2,415
CWM	195,570	3,925
VCU	690,544	4,744
GMU	279,344	5,195
UVA	1,394,586	5,456
Total	**3,510,594**	**3,864**

Source: JLARC staff analysis of institutional research space data and SCHEV K1 research expenditures.

Between FY 2005 and FY 2012, Virginia's research institutions experienced a 42 percent increase in total research space, from 2.5 million square feet to 3.5 million square feet. Collectively, research institutions increased their research square footage per $1 million in research activity by 17 percent between FY 2005 and FY 2012 (Table 26). Two schools, ODU and VT, experienced declines in normalized square footage due to their research activity increasing at a faster rate than their addition of new research space. The other research institutions increased square footage per $1 million in research activity, with the greatest increases at CWM and UVA.

Table 26: Four of Six Research Institutions Increased Research Square Footage per $1 Million in Research Activity (FY 2005–FY 2012)

Institution	Change in research square footage per $1 million in research activity
CWM	93%
UVA	62
GMU	51
VCU	19
VT	-19
ODU	-34
Research institutions	**17%**

Note: VCU data are reported for the FY 2008 to FY 2012 period.

Source: JLARC staff analysis of institutional research space data and SCHEV K1 report data on total research activity by institution.

Although research space per $1 million in research activity at ODU declined between FY 2005 and FY 2012, most of the university's growth in aggregate research space between FY 2005 and FY 2012 was related to the opening of two new facilities, according to staff. The first, a new physical sciences building, represented a need to accommodate increased enrollment and research in STEM-H disciplines. The second, a modeling, analysis, and simulation center, was built to accommodate the specific needs of a growing area of research activity at the university. UVA staff indicated that much of the construction, renovation, and expansion of research facilities on the UVA campus replaced inadequate and aging facilities and accommodated planned growth in several research disciplines. Similarly, CWM staff attributed its increase in research space to the construction of a new science center and the renovation and expansion of research space in its existing science building.

Institutions Spent $3.4 Billion to Construct or Renovate Instructional and Research Space

Virginia's institutions reported $2.5 billion in construction and $880 million in renovation expenditures on buildings containing instructional and research space between FY 2005 and FY 2012 (Table 27). Construction expenditures at research institutions ranged from $108.9 million at ODU to $770.9 million at UVA. Renovation expenditures for the period ranged from $21.0 million at GMU to $417.7 million at UVA. Master's and baccalaureate institutions also had significant construction expenditures, ranging from $14.6 million at UMW to $164.5 million at JMU. Renovation expenditures ranged from $3.9 million at CNU to $49.4 million at VSU. Renovation expenditures reported by the institutions include capital projects funded from maintenance reserve.

Table 27: Virginia Institutions Spent $2.5 Billion on Construction and $900 Million on Renovation (FY 2005–FY 2012)

Institution	Construction expenditures ($ Millions)	Renovation expenditures ($ Millions)
CNU	$162.3	$3.9
JMU	164.5	26.8
LU	43.0	17.3
NSU	48.0	15.4
RU	63.6	14.8
UMW	14.6	19.8
UVA-Wise	67.6	12.1
VMI	17.3	52.1
VSU	79.6	49.4
Master's & baccalaureate institutions	**$660.4**	**$211.6**
CWM	177.3	68.7
GMU	308.3	21.0
ODU	108.9	34.7
UVA	770.9	417.7
VCU	157.1	64.9
VT	301.6	63.1
Research institutions	**$1,824**	**$670.1**
Total	**$2,484**	**$880.7**

Note: Numbers may not add due to rounding. Renovation expenditures include maintenance reserve.

Source: JLARC staff analysis of institutional data.

According to the Department of General Services, the average cost of construction or renovation of instructional and research space in Virginia higher education institutions varies greatly by space type. For example, in FY 2012 new classroom buildings cost an average of $232 per square foot to construct, with renovations costs for these types of spaces ranging from $53 per square foot to $120 per square foot. Dry labs, such as those used for physics and engineering, had average construction costs ranging from $232 to $280 per square foot, and renovation costs ranging from $75 and $168 per square foot. Wet labs, most commonly used for chemistry and biology, had construction costs ranging from $247 to $350 per square foot and renovation costs averaging $222 per square foot.

Institutional Spending to Operate and Maintain Instructional and Research Facilities Increased 12 Percent

The additional instructional and research space at Virginia's institutions must be operated and maintained on an ongoing basis. Consequently, in addition to the capital spending to construct or

renovate facilities, institutions are spending more on operations and maintenance (O&M).

In FY 2012, institutions reported a total of $223.7 million in O&M expenditures for facilities containing instructional and research space, and these costs have grown in recent years. Reported inflation-adjusted O&M expenditures per student FTE increased 12 percent statewide between FY 2005 and FY 2012 (Table 28). At the institutional level, the change in O&M expenditures per student varied greatly, from reductions at UVA-Wise (–45 percent) and VCU (–24 percent), to increases at UVA (48 percent) and CWM (97 percent).

Table 28: O&M Expenditures Increased 12 Percent per Student (FY 2005–FY 2012)

Institution	Inflation-adjusted change in O&M expenditures per student
CWM	97%
UVA	48
ODU	41
RU	25
JMU	24
GMU	18
VMI	8
CNU	2
VT	1
LU	0
VSU	-14
NSU	-20
VCU	-24
UVA-Wise	-45
Statewide	**12%**

Note: UMW did not report O&M Expenditures.

Source: JLARC staff analysis of institutional data, SCHEV enrollment data.

DUE TO OUTDATED SPACE GUIDELINES, NEED FOR INSTRUCTIONAL AND RESEARCH SPACE CANNOT BE ADEQUATELY ASSESSED

Although institutions constructed substantial additional square footage between FY 2005 and FY 2012, many have had low utilization rates over the past decade, according to SCHEV's guidelines. Additionally, although the guidelines show a significant deficit of research space, several institutions commented that the projections were more than was needed to support their current research activity. The space utilization and research space need guidelines are out-of-date and may not accurately reflect institutional use of space. This makes it difficult to assess the extent to which institutions have constructed more space than needed.

SCHEV Maintains Guidelines for Utilization of Instructional Space and Need for Research Space

Classroom and Lab Stations

"Station" refers to the space allocated for one student, such as a desk, a seat on a laboratory bench, or a chair in a lecture hall.

SCHEV maintains instructional space need guidelines. Its assessment of the need for instructional space is based on standards of physical productivity developed in the late 1970s and early 1980s. Few changes have been made to the recommended guidelines since their implementation.

Physical productivity is commonly used to assess space use when it is not supported by an underlying revenue stream. Physical productivity measures how effectively and intensely space is used. SCHEV measures physical productivity (or space utilization) of instructional space in three ways (Table 29). These guidelines are slightly less rigorous than the average of those used by other states incorporating space utilization in capital construction planning during the mid-2000s.

Table 29: SCHEV Measures Space Utilization According to Three Criteria

Measurement of productivity	Recommended guideline: classrooms	Recommended guideline: classroom labs
1. Average number of hours per week that rooms are used	40 hours per week	24 hours per week[a]
2. Average proportion of stations filled when classrooms and classroom labs are used	60% occupancy	75% occupancy[b]
3. Average number of hours per week that stations are used[c]	24 hours per week *(40 hours per week at 60% occupancy)*	18 hours per week *(24 hours per week at 75% occupancy)*

[a] Laboratories may be in use less frequently due to their specialized nature.
[b] Occupancy standards are higher for labs, which are more expensive to construct and equip.
[c] Primary criteria used to determine whether institutions meet space utilization guidelines.

Source: SCHEV's Fixed Asset Guidelines.

SCHEV's Research Space Need Guidelines

SCHEV's guidelines exclude space supported by State general funds (i.e., agriculture at VT and VSU and marine science at CWM's VIMS campus). They also exclude research space related to medicine, dentistry, and veterinary medicine, for which SCHEV determines need on a case-by-case basis.

SCHEV also maintains research space need guidelines. SCHEV bases its assessment of research space need upon financial productivity standards. Financial productivity measures revenue generated or a rate of return per square foot. Research generates revenue from external funding sources and provides a return on investment. SCHEV's research space need guidelines recommend:

1. 800 ASF of research space for every $100,000 in annual research expenditures in space-intensive disciplines (e.g., engineering, biological sciences, and the physical sciences); this

guideline measures expenditures in constant 1993 dollars (approximately $154,418 in 2011 dollars);

2. 450 ASF of research space for every $100,000 in annual research expenditures in disciplines requiring less space (e.g., business, mathematics, and social sciences); this guideline measures expenditures in constant 1993 dollars (approximately $154,418 in 2011 dollars); and

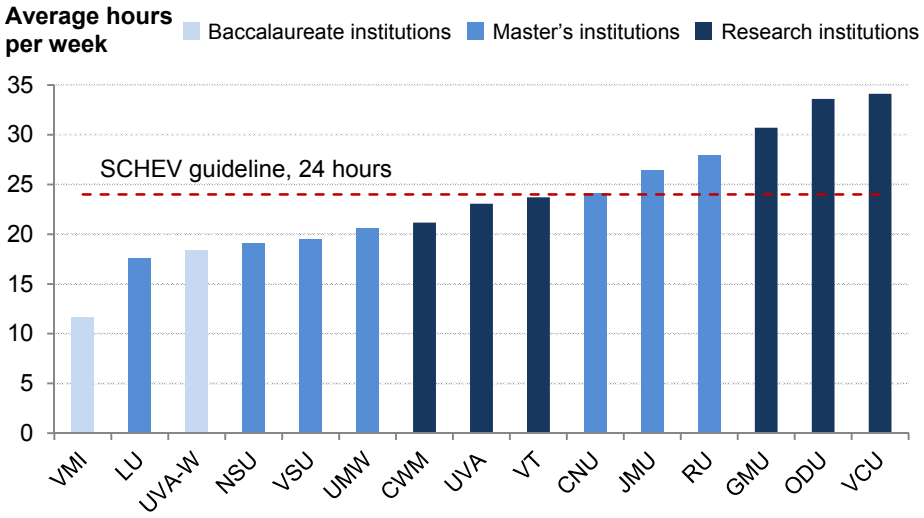
3. 10 ASF per annual FTE on-campus graduate student in all disciplines except medicine, dentistry, and veterinary medicine.

Fewer Than Half of Institutions Meet State Guidelines for Use of Instructional Space

Since 2000, fewer than half of institutions met SCHEV's classroom utilization guideline of 24 hours per week (Figure 21). In 2010, only six institutions met or exceeded SCHEV's utilization guidelines.

Institutions that met or exceeded classroom utilization guidelines generally had larger student enrollment, as was the case with Virginia's research institutions. Research institutions averaged 28 hours of use per week, compared with 22 hours at master's institutions and 15 hours at baccalaureate institutions.

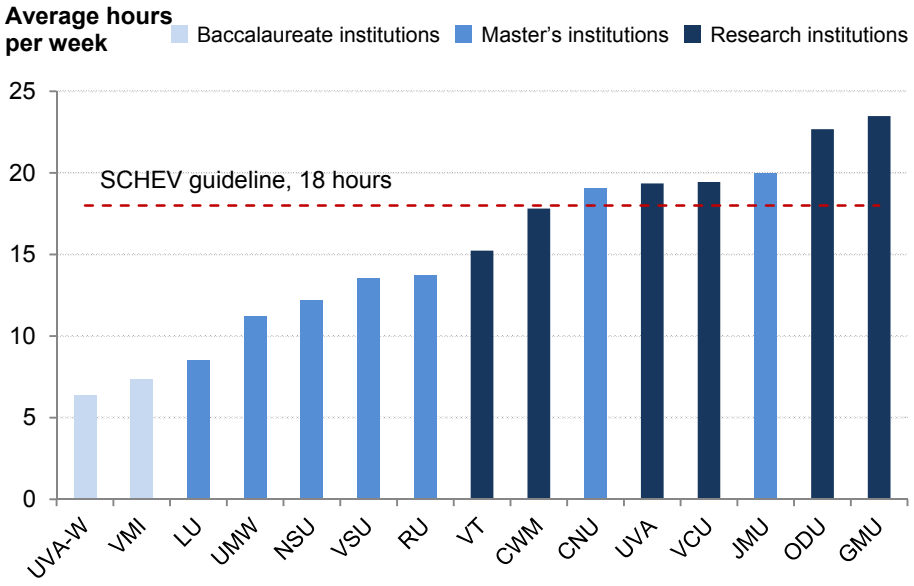
Figure 21: Fewer Than Half of Institutions Met State Guideline for Classroom Space (2010)



Note: Assessed using SCHEV guidelines for space utilization, measurement three (average number of hours per week that classroom stations are used). UVA utilization is for main campus (excludes North Grounds campus). UMW utilization is for main campus (excludes Stafford campus). GMU utilization is for main campus (excludes Arlington and Prince William campuses). VCU utilization is for main campus (excludes Health Sciences campus).

Source: JLARC staff analysis of classroom utilization data provided by SCHEV.

Figure 22: Fewer Than Half of Institutions Met State Guideline for Classroom Labs (2010)



Note: Assessed using SCHEV guidelines for space utilization, measurement three (average number of hours per week that classroom laboratory stations are used). UVA utilization is for main campus (excluding the North Grounds campus). UMW utilization is for main campus (excluding the Stafford campus). GMU utilization is for main campus (excluding the Arlington and Prince William campuses). VCU utilization is for main campus (excluding the Health Sciences campus).

Source: JLARC staff analysis of classroom laboratory utilization data provided by SCHEV.

Six institutions met or exceeded SCHEV's classroom laboratory utilization guideline in 2010 (Figure 22). Research institutions averaged 20 hours of use per week, compared with 14 hours at master's institutions and 7 hours at baccalaureate institutions.

Institutional staff noted a number of factors, supported by the literature, that may prevent higher utilization of space. Certain disciplines, such as nursing, require classroom space with equipment specific to the discipline. Institutions may be unable to schedule courses for other disciplines in those rooms. For example, JMU's nursing program schedules courses on Tuesdays and Thursdays from 7 a.m. to 10 p.m. On other days, the classrooms are available, but the space is too specialized to be used by other disciplines.

Another consideration is the type and quality of instructional space. Older buildings may not have been constructed to accommodate shifting discipline enrollments. For example, as enrollment in STEM-H fields has grown, institutions require additional space for course lab sections. Specialized accreditation requirements in certain disciplines may require a discipline to be housed in a single facility, and disciplines may outgrow their current location.

Staff at one Virginia institution mentioned that the poor condition of some instructional space, particularly classroom laboratory space, renders it unusable (Figure 23). The inclusion of these rooms in SCHEV's inventory may negatively affect an institution's utilization rates. A prior JLARC review of capital outlay in higher education (1996) recommended that SCHEV increase its review of the accuracy of its space inventory and periodically perform onsite reviews to ensure the accuracy of reported information. These efforts could also be used to ensure that unusable space is removed from the inventory and potentially prioritized for renovation.

Figure 23: Poor Space Quality May Negatively Affect Space Utilization

Biology Classroom Lab

Biochemistry Classroom Lab

Chemistry Prep Lab

Source: NSU staff.

Research Institutions Had Research Space Below SCHEV Guidelines, Though Guidelines May Overestimate Need

In 2009-10, Virginia's six research institutions had 63 percent of the total research ASF recommended under SCHEV's guidelines, on average. This ranged from 29 percent of recommended research ASF at UVA to 82 percent at ODU. SCHEV revised the space need guidelines for Virginia's research institutions in 2010. Whereas the guidelines originally used actual research expenditures to determine space need, the revised guidelines now use projected expenditures. Under the revised guidelines, research institutions have 51 percent of recommended research ASF, on average, indicating a greater total need for research space. Most institutions show larger research space deficits. The research space needs for VT, in particular, more than doubled to almost 2 million ASF.

Staff at several research institutions mentioned that approximately 100,000 ASF of research space is equivalent to one new research facility. The original guidelines show a deficit of 2.4 million ASF, or an additional 24 research facilities. The revised guidelines show a deficit of 3.7 million ASF, or an additional 37 research facilities.

Although the research institutions have the greatest deficit of space, the master's and baccalaureate institutions have been increasing their research space at a faster rate. Many face a moderate shortage of research space (less than 8,000 ASF). NSU has a deficit of 36,300 ASF.

SCHEV Should Improve Its Instructional and Research Space Guidelines to Facilitate Better Decision Making

Staff at several institutions mentioned that they place little emphasis on SCHEV's space utilization guidelines when making space management or capital planning decisions, for several reasons: First, SCHEV's instructional space utilization guidelines are not consistent with how institutions now use instructional space. Pedagogy and technology have evolved over the past 40 years, changing institutional space needs and utilization patterns. When the guidelines were developed, classes were typically lecture-based and required little more than a chalkboard and student desks. Now, faculty increasingly incorporate internet technology and interactive student learning, such as small group work, into their courses. To accommodate new technology and pedagogy, classrooms require flexibility, may require special seating arrangements to accommodate wiring or equipment needs, and typically incorporate movable seating. These changes require more square footage per student.

Many institutions also use instructional space for academic events outside of regularly scheduled class time, such as review sessions or guest lectures, or non-academic events, such as student group meetings. For example, CWM staff reported 241 events totaling 426 hours in addition to regularly scheduled classes in October 2012. This use is not captured by space utilization guidelines, but it shows that institutions may be using instructional space to a greater extent than indicated through utilization rates.

Second, SCHEV staff have noted that there are concerns with using the revised guidelines for research space, which are based on projections, given the current funding climate for research. Also, guidelines appear to overstate the need for research space at certain institutions. For example, the original guidelines show UVA with a deficit of 1.4 million ASF, while the revised guidelines show VT with a deficit of 2 million ASF. Staff at both institutions indicated that they do not currently need this much additional space. The research guidelines also show master's and baccalaureate institutions with little or no need for research space, despite State policies directing increased STEM-H research and specialized accreditation requirements that may require faculty to conduct research.

SCHEV staff indicated that the agency is considering returning to the use of the original research space guidelines, which would improve the accuracy of the process. Several institutions have suggested convening a working group to revise definitions and ensure that the instructional and research space guidelines reflect the current use of space.

As noted above, institutions spent billions on capital projects in recent years, increasing their instructional space per student and research space per $1 million in research activity. This spending occurred while certain institutions appeared to be considerably below current instructional space utilization guidelines. Because of the concerns with the guidelines, it is unclear whether the spending and expansion of space was fully necessary. SCHEV should improve its instructional and research space guidelines so that they adequately (1) measure current institutional use and need and (2) help assess whether continued, additional capital spending is necessary.

Recommendation (6). The State Council of Higher Education for Virginia should convene a working group of institutional staff to develop instructional and research space guidelines that adequately measure current use of space and plans for future use of space at Virginia's public higher education institutions.

Institutions are individually implementing a variety of initiatives to ensure efficient capital spending. These include focusing on energy efficiency to reduce O&M expenditures and renovating facilities rather than building new ones. (Appendix G includes examples of these types of initiatives.)

JLARC Recommendations: Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions

1. The General Assembly may wish to consider regularly re-basing appropriated and actual average faculty salaries. (Chapter 2)

2. The State Council of Higher Education for Virginia should benchmark average faculty salaries at the discipline level and improve the transparency of the peer group process by reporting the outcomes of its statistical model, as well as the rationale for making modifications to the peer groups selected through the model. (Chapter 2)

3. Boards of visitors should consider requiring their institutions to conduct and participate in national faculty teaching load assessments that facilitate benchmarking average faculty teaching loads against similar institutions. The assessments should measure national average teaching loads by discipline and faculty type. (Chapter 3)

4. The General Assembly may wish to consider appropriating funding for the State Council of Higher Education for Virginia to coordinate a committee of institutional representatives, such as the previously authorized Learning Technology Advisory Committee. In addition to the objectives set out in the Appropriation Act for the Learning Technology Advisory Committee, the committee should identify instructional technology initiatives and best practices for directly or indirectly lowering institutions' instructional expenditures per student while maintaining or enhancing student learning. (Chapter 4)

5. The General Assembly may wish to consider amending the Code of Virginia to direct the State Council of Higher Education for Virginia to track State funding for higher education research from all sources and develop a process for institutions to report on the progress of State-supported research projects. (Chapter 6)

6. The State Council of Higher Education for Virginia should convene a working group of institutional staff to develop instructional and research space guidelines that adequately measure current use of space and plans for future use of space at Virginia's public higher education institutions. (Chapter 7)

Appendix A Study Mandate

HOUSE JOINT RESOLUTION NO. 108

Directing the Joint Legislative Audit and Review Commission to study the cost efficiency of the Commonwealth's institutions of higher education and to identify opportunities to reduce the cost of public higher education in Virginia. Report.

Agreed to by the House of Delegates, February 10, 2012
Agreed to by the Senate, February 28, 2012

WHEREAS, "Preparing for the Top Jobs of the 21st Century: The Virginia Higher Education Opportunity Act of 2011" has set a goal of awarding 100,000 more degrees over the next 15 years; and

WHEREAS, the State Council of Higher Education in Virginia has reported that the average increase for in-state undergraduate tuition and mandatory fees from the 2009-2010 school year to the 2010-2011 school year was 13.1 percent at four-year institutions; and

WHEREAS, the Joint Legislative Audit and Review Commission has reported in its 2011 Review of State Spending that tuition revenue for Virginia's public colleges and universities increased 110 percent between 2002 and 2009, while inflation increased only 23 percent during that period; and

WHEREAS, the Joint Legislative Audit and Review Commission has reported that Virginia's average annual in-state tuition and fees at public four-year institutions of higher education was $8,814 in 2010, ranking as the fourteenth highest average in the nation; and

WHEREAS, the increasing costs of higher education have forced many students to incur significant debt in order to complete their degrees, with the Institute for College Access and Success reporting that the average student debt for Virginia public institutions of higher education is $19,918, and that 57 percent of students have debt related to their higher education; and

WHEREAS, the increasing costs of higher education and the growing debt burden for students may limit access to educational opportunities, adversely affect growth

in other sectors of Virginia's economy, and be an obstacle to the goal to award 100,000 more degrees over the next 15 years; and
WHEREAS, in December 2009 the Joint Legislative Audit and Review Commission authorized its staff to complete a study of the cost efficiency of higher education in Virginia, but, because of workload demands from joint study resolutions adopted by the General Assembly, such a study could not be completed; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, that the Joint Legislative Audit and Review Commission be directed to study the cost efficiency of the Commonwealth's institutions of higher education and to identify opportunities to reduce the cost of public higher education in Virginia.

In conducting its study, the Joint Legislative Audit and Review Commission (JLARC) shall consider (i) teaching loads and productivity of faculty; (ii) the impact of faculty research on tuition and other costs; (iii) incentives created by existing faculty compensation models; (iv) design and utilization of facilities; (v) operation of enterprise activities; (vi) the use of technology for academic programs and administrative functions; (vii) administrative staffing and costs; (viii) scholarships and other student aid programs; (ix) the use of outsourcing and public-private partnerships; (x) the use of cooperative procurement; (xi) the impact of nonacademic activities and programs on tuition and fees; (xii) sources of revenue and income, and how these sources are allocated toward academic, administrative, and other costs; (xiii) opportunities to reduce the cost of public higher education in Virginia; and (xiv) such other related matters as it may deem appropriate

Technical assistance shall be provided to the Joint Legislative Audit and Review Commission by the State Council for Higher Education in Virginia and all state-supported institutions of higher education. All agencies of the Commonwealth shall provide assistance to JLARC for this study, upon request.

The Joint Legislative Audit and Review Commission shall complete its meetings for the first year by November 30, 2013, and for the second year by November 30, 2014, and the Chairman shall submit to the Division of Legislative Automated Systems an executive summary of its findings and recommendations no later than the first day of the next Regular Session of the General Assembly for each year. Each executive summary shall state whether JLARC intends to submit to the General Assembly and the Governor a report of its findings and recommendations for publication as a House or Senate document. The executive summaries and reports shall be submitted as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents and reports and shall be posted on the General Assembly's website.

Appendix B

Research Activities and Methods

JLARC staff conducted the following primary research activities:

- site visits to or structured interviews with all 15 public four-year institutions in the State;
- structured interviews with institutional administrative staff, faculty, State agency staff, experts in various aspects of higher education, and institutional and state officials in other states;
- a survey of teaching and research faculty at Virginia's four-year public institutions;
- quantitative analysis of institutions' expenditures related to academic programs, faculty workloads, faculty compensation, research activity, and construction, renovation, and operation and maintenance of instructional and research space;
- review of institutional studies and the research literature; and
- case studies of select faculty members.

SITE VISITS AND STRUCTURED INTERVIEWS

Site visits and structured interviews were key research methods used by JLARC staff in conducting research for this report. JLARC staff conducted site visits to all 15 public four-year Virginia institutions, structured interviews with university administrative staff, and interviews with state agency staff at SCHEV, APA, DPB, and Treasury.

Staff and Faculty at Public Four-Year Institutions in Virginia

Site visits and phone interviews were conducted with administrative staff at each institution to obtain broad information about topics such as faculty workloads, faculty compensation, academic program offerings, faculty research activities, and facilities. JLARC staff also met separately with function-specific administrators to obtain more detailed information in certain areas of interest.

Additionally, JLARC staff conducted faculty group interviews at some Virginia institutions. Faculty were asked to discuss faculty compensation, faculty workloads, opportunities for institutions to increase faculty productivity, and potential roles for the State or

General Assembly in these areas. These group interviews supplemented a statewide faculty survey by allowing JLARC staff to collect qualitative information and opinions.

State Agency Staff

JLARC staff conducted structured interviews with staff at SCHEV, APA, DPB, DGS, DOA, JCOTS, and staff from House Appropriations and Senate Finance in order to discuss various aspects of the project. Topics discussed included the availability of various types of data; the State's guidelines for academic programs, facilities, and capital planning; capital projects authorized by the General Assembly; and the budgeting and appropriation process for public higher education institutions.

Higher Education Experts and Institutional Staff from Other States

Finally, JLARC staff interviewed several higher education experts through the course of the project, including David Feldman and Robert Archibald at William & Mary; Bill Shobe, David Breneman, Margaret Miller, and Brian Pollak at the University of Virginia; Andrew Gillen at Education Sector; Ronald Ehrenberg at Cornell University; Marilyn Amey and James Fairweather at Michigan State University; Richard Spies at the Ithaka Foundation; Allison Walters and Michael Middaugh at the University of Delaware; James Monks at the University of Richmond; and Carol Twigg at the National Center for Academic Transformation. These interviews were conducted to obtain information on various higher education topics in Virginia and nationwide.

JLARC staff also conducted phone interviews with institutional- and state-level higher education administrators in Nebraska, New Jersey, North Carolina, Texas and Maryland. These interviews were conducted to obtain institutional- and state-level information on higher education trends in policy and funding in other states, and nationally.

QUANTITATIVE ANALYSIS

JLARC staff collected data from a variety of sources during the course of this study.

National Comparative Data

Data from the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) were obtained on institutional spending in Virginia and elsewhere between FY 1992 and FY 2011. Data were also obtained on 2011-12 average salaries and Carnegie classifications for Virginia's public four-year institutions and institutions nationally. Average salaries for Virginia's

public four-year institutions were compared against both national average salaries by Carnegie classification and against Virginia's appropriated salary averages.

Data from the Association of American University Professors (AAUP)'s 2011-12 Annual Report on the Economic Status of the Profession were obtained on average salaries and total compensation for national four-year institutions and assigned Carnegie classifications. National averages by Carnegie classification were compared to average salaries and average compensation for the Virginia institutions participating in AAUP's faculty compensation survey.

Data from the College and University Professionals Association for Human Resources (CUPA-HR)'s 2011-12 Faculty Salary Survey for Four-Year Colleges and Universities By Discipline, Rank and Tenure Status were obtained on T&R average salaries at the discipline-level (two-digit CIP code) for national four-year institutions by Carnegie classification. National averages were compared to average salaries at Virginia's public Master's and Baccalaureate institutions for three faculty ranks: full professor, associate professor, and assistant professor.

Data from Oklahoma State University (OSU)'s Office of Institutional Research and Information Management's 2011-12 Faculty Salary Survey by Discipline were obtained on average salaries at the discipline-level (two-digit CIP code, as well as the four-digit CIP code for veterinary medicine) for public Doctoral institutions. National averages were compared to average salaries at Virginia's Research institutions.

Data from the University of Delaware's National Study of Instructional Costs and Productivity were obtained on 2004 and 2010 faculty teaching loads. National averages were compared against data on faculty teaching loads that JLARC staff collected from Virginia's public four-year institutions, as discussed later in this section.

Data from the National Science Foundation was collected and analyzed to identify total research expenditures at Virginia institutions, total higher education research expenditures in Virginia, sources of funds used for higher education research, and the academic fields in which research activities occurred at Virginia institutions.

Data from the U.S. Census Bureau and Bureau of Economic Analysis (BEA) were used to gather state-level populations and to adjust expenditures for inflation, respectively.

Data Provided by State Agencies

The Auditor of Public Accounts (APA) provided JLARC staff with Virginia higher education institutions' Audited Financial Statements. These were used to identify total expenditures on instruction in FY 2005 and FY 2012.

SCHEV staff provided student FTE enrollments by institution for the previous decade, in addition to student credit hour enrollments by institution, and for 15 select academic disciplines and sub-disciplines. SCHEV enrollment data were used to normalize expenditures in many categories, allowing for cross-institutional comparisons.

Additionally, SCHEV staff provided data related to Virginia institutions' peer groups, including Virginia institutions' percentile rankings in their peer group, peer institutions' average salaries, and the amount of the 60th percentile goal for each Virginia institution. Data included Virginia institutions' appropriated average salaries. SCHEV staff also provided T&R faculty FTE used in budgeting for FY 2012, which includes only programs 10110, 10120 and 10130. JLARC staff used the FTE to calculate the funding shortfall for the 60th percentile.

SCHEV also provided data related to academic and research space at Virginia's four-year institutions. This included data on classroom and classroom laboratory space utilization used to assess Virginia institutions' utilization of instructional space in fall 2010, and data on research space need used to assess Virginia institutions' need for research space in 2009-10.

Finally, SCHEV provided data on the prevalence of technology-enhanced courses at each of Virginia's four-year public institutions.

JLARC Staff Used Seven Criteria to Select Academic Disciplines for Review

The study team used one primary criterion and six secondary criteria to select academic disciplines for review (Table B-1). These criteria were selected based on interviews with staff at Virginia's public higher education institutions, interviews with experts on higher education, and other characteristics relevant for the study team's analyses such as those related to faculty compensation.

JLARC staff used these seven criteria to select a total of 12 disciplines, defined as two-digit Classification of Instructional Programs (CIP) codes, and three sub-disciplines, defined as four-digit CIP codes, for inclusion in the study (Table B-2). Statewide, these 15 disciplines and sub-disciplines accounted for 77 percent of stu-

Table B-1: Study Team Used One Primary and Six Secondary Criteria for Selecting Academic Disciplines

Criterion	Importance	Description and Rationale
Student Credit Hours	Primary	Highest number of student credit hours taught in the discipline, at both the undergraduate and graduate level, to focus analyses on disciplines potentially accounting for the majority of instructional costs.
Commonality	Secondary	Highest number of Virginia's public four-year higher education institutions offering the discipline, to allow for comparisons across institutions.
Cost per Student	Secondary	Range of cost per student based on interviews with institutional staff to explain why costs may vary across disciplines.
Discipline Type	Secondary	Selection of at least one discipline from each of the discipline groups developed by the State Council of Higher Education for Virginia's base adequacy calculations, to ensure representation of the full range of disciplines.
Growth in Amount of Instruction Provided	Secondary	Highest growth rate over the past five years in student credit hours, weighted by the discipline's student credit hours in the most recent year, to include emerging disciplines.
Salary Compression	Secondary	Varying extent to which salary compression exists, measured as the difference between the average salary of an assistant professor and a new assistant professor, to include disciplines with and without salary compression.
Salary Range	Secondary	Varying average salary of a professor in the discipline, to include disciplines with a range of average professor salaries.

Source: JLARC staff analysis.

Table B-2: Twelve Disciplines and Three Sub-Disciplines Were Selected for Review

CIP Code	Discipline
11	Computer and Information Sciences and Support Services
13	Education
14	Engineering
23	English Language and Literature/Letters
26	Biological and Biomedical Sciences
27	Math and Statistics
40	Physical Sciences
40.05	Chemistry
40.08	Physics
42	Psychology
45	Social Sciences
40.06	Economics
50	Visual and Performing Arts
51	Health Professions and Related Programs
52	Business, Management, Marketing, and Related Services

Source: JLARC staff analysis.

dent credit hours in the 2004-05 academic year and 76 percent of student credit hours in the 2011-12 and 2012-13 academic years. At individual institutions during these years, the percentage of student credit hours for which these 15 disciplines and sub-disciplines accounted ranged from 65 to 87 percent.

Data Provided by Virginia Institutions

JLARC staff developed three data collection instruments for completion by the institutions. The instruments requested information on faculty instructional workloads; average class sizes; faculty compensation; faculty composition; direct instructional expenditures at the discipline level; and construction, renovation, and operations and maintenance expenditures for instructional and research facilities. All 15 institutions responded to the instruments. However, several institutions provided only partial responses. (Table B-3)

Table B-3: Institutions Response to JLARC Data Collection Instruments

Institution	Academic Expenditures	Faculty Workloads	Facilities Expenditures	Research[a]
CNU	✓	✓	✓	n.a.
CWM	Partial response for FY 2005	✓	✓	✓
GMU	✓	✓	✓	✓
JMU	Provided academic year FTE	✓	✓	n.a.
LU	No FY 2005, provided FY 2008	No FY 2005, provided FY 2008	✓	n.a.
NSU	Partial FY 2005 salaries, no FY 2005 benefits	✓	✓	n.a.
ODU	✓	✓	✓	✓
RU	✓	✓	✓	n.a.
UMW	✓	✓[b]	Did not report O&M expenditures	n.a.
UVA	✓	✓	✓	✓
UVA-Wise	✓	✓	✓	n.a.
VCU	No FY 2005, provided FY 2008	No FY 2005; partial response for FY 2011	No FY 2005, provided FY 2008	✓
VMI	✓	✓	✓	n.a.
VSU	No FY 2005, partial FTE for FY 2011 & FY 2012	✓[c]	✓	n.a.
VT	No part-time FTE for benefits	✓	✓	✓

Note: "n.a." is not applicable.

[a] Research instrument only provided to the Research Institutions.
[b] Data was excluded from the report because UMW was unable to report SCHs and course sections by type of faculty.
[c] VSU partially responded to the data request but data was excluded from the report because JLARC staff were unable to validate it.

Source: JLARC staff analysis.

JLARC staff also sent a research instrument to the six Research institutions. The instrument requested data on funded research expenditures, faculty involved in research, indirect facilities and administrative costs, and cost sharing. All six Research institutions provided full responses to the instrument.

Faculty Compensation Data. JLARC staff collected data on faculty headcount and full-time equivalents (FTEs) for the three faculty types by tenure-status. On the recommendation of several institutions, JLARC staff operated under the assumption that the headcount and FTE for full-time faculty was equivalent. Although institution-wide data was collected from all 15 institutions, three institutions were unable to provide complete faculty FTE data in FY 2005 due to recently changed accounting systems. One institution was unable to provide faculty FTE for part-time faculty and for supplemental faculty in FY 2005, and one institution did not report FTE for student teaching assistants. Another institution provided FTE that corresponded with the academic year, to more accurately reflect the difference between the fiscal year data requested and its start dates for academic year contracts. These limitations are noted where applicable in the report.

JLARC staff collected data on total institution-wide salary expenditures for FY 2005, FY 2011, and FY 2012, as well as the total headcount and FTE of faculty members receiving salary payments for each of the three faculty types and category of tenure-status by faculty FTE. Although institution-wide data was collected from all 15 institutions, three institutions were unable to provide data for FY 2005 due to recently changed accounting systems. Another institution was able to provide partial faculty FTE for FY 2005. These limitations are noted where applicable in the report.

JLARC staff collected data on institution-wide benefit expenditures for full-time faculty by faculty type (T&R faculty, both non-medical school and medical school; research faculty; and clinical faculty) and benefit type for FY 2005, FY 2011, and FY 2012. Institutions were asked to follow definitions and methodology used by the AAUP's Annual Report on the Economic Status of the Profession. Expenditures for benefits provided as a percentage of salary were not adjusted for contract length, while all other benefits were adjusted. Institutions were also asked to report total benefit expenditures and an unduplicated headcount for each of the faculty types, as well as benefit expenditures and headcount and FTE for part-time faculty. These expenditures have not been adjusted for faculty contract-length. Although institution-wide data was collected from all 15 institutions, four institutions were unable to provide data for FY 2005 due to recently changed accounting systems. These limitations are noted where applicable in the report.

JLARC staff calculated total compensation spending by adding institution-wide expenditures on faculty salaries and institution-wide expenditures on faculty benefits, both of which were not adjusted for faculty contract-length. Although institution-wide data was collected from all 15 institutions, four institutions were unable to provide complete data for both salaries and benefits in FY 2005 due to recently changed accounting systems. This limitation is noted where applicable in the report. Compensation expenditures were adjusted for inflation where noted in the report.

JLARC staff also collected data on the sources of funding used to pay for faculty compensation. JLARC staff asked institutions to report the amount of funding used to pay for salaries, salary supplements, and benefit expenditures from five different sources: general funds and tuition and fee revenue, the State match for the Eminent Scholars' program, research grant funds, endowment funds and private giving, and other sources of funding, including nongeneral funds from the State Fiscal Stabilization Fund (funds from the American Recovery and Reinvestment Act).

JLARC staff also collected discipline-level average salaries (for selected disciplines) for fall 2004, fall 2010, and fall 2011. To ensure comparability with national average salary data at the discipline-level obtained by JLARC staff, institutions were asked to follow definitions and methodology used by CUPA-HR's 2011-12 Faculty Salary Survey for Four-Year Colleges and Universities By Discipline, Rank and Tenure Status, including adjusting average salaries to a 9/10 month contract length. Similar methodology and definitions are used by OSU's Faculty Salary Survey by Discipline.

For the selected disciplines, JLARC staff compared average salaries for tenured, tenure-track, and non-tenure-track T&R faculty at three ranks (full professors, associate professors, and assistant professors) to national averages. Virginia's six Research institutions (CWM, GMU, ODU, UVA, VCU, and VT) were compared to national averages from OSU's 2011-12 Faculty Salary Survey by Discipline for doctoral institutions. Virginia's seven Master's institutions (CNU, JMU, LU, NSU, RU, UMW, and VSU) were compared to national averages from CUPA-HR's 2011-12 Faculty Salary Survey for Four-Year Colleges and Universities By Discipline, Rank and Tenure Status for master's institutions. Virginia's two Baccalaureate institutions (UVA-W and VMI)) were compared to national averages from CUPA-HR's 2011-12 Faculty Salary Survey for Four-Year Colleges and Universities By Discipline, Rank and Tenure Status for baccalaureate institutions.

Although discipline-level data was collected from all 15 institutions, three institutions were unable to provide data for FY 2005 due to recently changed accounting systems. Another institution

was able to provide partial faculty FTE for FY 2005. Additionally, some institutions were unable to report only salary expenditures for the specific academic disciplines requested due to their accounting systems. The inclusion of faculty from other disciplines is noted, where applicable, in Appendix C on salary benchmarking.

Faculty Workloads. JLARC staff collected data on average faculty teaching loads and class sizes in the fall 2004 and fall 2010 semesters from Virginia's public four-year institutions. Data was obtained for each institution as a whole and for select disciplines at each institution. To ensure comparability with national averages that JLARC staff obtained, institutions were asked to follow the definitions and reporting guidelines used by the University of Delaware's National Study of Instructional Costs and Productivity. While all 15 institutions responded, one institution (UMW) was unable to provide data on average faculty teaching loads by faculty type although it did provide data for all full-time faculty combined; one institution (VSU) provided data that JLARC staff could not validate; and two institutions (LU, VCU) were unable to provide data for the fall 2004 semester due to recently changed accounting systems. These limitations are noted where applicable in the report.

Using this data, JLARC staff calculated average faculty teaching loads at Virginia institutions by dividing (i) the total number of student credit hours or course sections taught by a given type of faculty, by (ii) the number of faculty FTEs, adjusted to exclude faculty FTEs separately budgeted for purposes other than teaching, such as research or service. This adjustment was made to ensure comparability with national data from the University of Delaware's National Study of Instructional Costs and Productivity. The percentage of total faculty FTEs that was separately budgeted in Virginia was approximately six percent in both the fall 2004 and fall 2010 semesters.

For select disciplines, JLARC staff compared Virginia's faculty teaching loads to national averages from the Delaware Study. Virginia's six research institutions (CWM, GMU, ODU, UVA, VCU, and VT) were compared to the national average for research institutions. Virginia's master's and baccalaureate institutions were compared to a weighted national average that JLARC staff calculated using the Delaware Study national averages for both master's and baccalaureate institutions. JLARC staff used this weighted national average for both Carnegie classifications combined rather than separate national averages for each Carnegie classification due to small samples for baccalaureate institutions in the Delaware Study. In two select disciplines, national averages were unavailable for baccalaureate institutions, so JLARC staff compared Virginia's baccalaureate and master's institutions to the

national average for master's institutions in those disciplines. Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such.

Instructional Expenditures. JLARC staff used several data sources to calculate average instructional expenditures at the institutional and discipline-levels for FY 2005 and FY 2012. Average institutional instructional expenditures were calculated by dividing total instructional expenditures as reported in institutions' Audited Financial Statements by total student credit hour enrollments provided by SCHEV. Discipline-level instructional expenditure averages were calculated by dividing discipline-level direct instructional expenditures data provided by Virginia institutions by discipline-level student credit hour enrollments as provided by SCHEV. Both institutional level and discipline-level average instructional expenditures were then adjusted for inflation.

Table B-4: Discipline-Level Expenditures

Institution	CIP11	CIP13	CIP14	CIP23	CIP26	CIP27	CIP40	CIP 40.05	CIP 40.08	CIP42	CIP45	CIP45.06	CIP50	CIP51	CIP52
CNU	✓		✓[a]	✓	✓	✓		✓[b]	✓[a]	✓	✓	✓[c]	✓		✓
CWM	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
GMU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
JMU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[c]	✓	✓	✓
LU		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NSU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓[d]
ODU	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
RU	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UMW	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
UVA	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UVA-Wise	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VCU			✓			✓		✓	✓	✓			✓		
VMI	✓[e]	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓[d]
VSU	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
VT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[a] reported in CIP11
[b] reported in CIP26
[c] reported in CIP52
[d] reported in CIP45.06
[e] reported in CIP27

Source: JLARC staff.

Identifying Institutional Cost of Research. JLARC staff collected data from the six Research institutions on cost share, recovered facilities and administrative (F&A) amounts, and unrecovered F&A amounts related to sponsored research for FY 2011 and FY 2012. Recovered F&A amounts were compared to total uncapped F&A amounts to obtain an F&A recovery rate.

To estimate institutional spending on research that is not externally funded, JLARC staff subtracted cost sharing and unrecovered F&A amounts from the total institutional research expenditures reported by NSF. VT provided refinements to this methodology for its calculation of institutional spending on research.

To estimate the maximum tuition and fee impact related to the unrecovered costs related to sponsored research, JLARC staff applied the institutional fund split to cost share and unrecovered F&A amounts.

To identify construction and renovation expenditures for instructional and research facilities, JLARC staff analyzed data provided by the four-year public institutions. Fund sources for construction and renovation expenditures were identified by 13 of the 15 four-year public institutions in follow-up requests made by JLARC staff. O&M expenditures were for instructional and research space were provided by 14 of the 15 institutions. Of those 14, 13 provided a pro-rate amount based upon the percentage of assignable square feet represented by instructional and research space.

Use of Facilities. Institutions provided several types of data related to facilities. For both FY 2005 and FY 2012 institutions reported instructional, research, other assignable, and non-assignable square feet for all buildings containing instructional and research space. These data were used, in combination with SCHEV student FTE enrollments and K1 research expenditures data, to normalize instructional and research square footage; this allowed for cross-institutional comparison and in single years, as well as assess trends in square footage between FY 2005 and FY 2012. Institutions also provided construction and renovation expenditures at the building-level. In a supplemental follow-up, institutions then provided data detailing the funding sources used for both construction and renovation, as well as apportioning construction and renovation expenditures to either instructional or research space. Institutions also provided O&M expenditures for instructional and research space; these expenditures were then normalized on a per student FTE basis. Due to differences in reporting, only the rates of growth in O&M expenditures per student FTE between FY 2005 and FY 2012 were reported.

JLARC STAFF SURVEYED TEACHING AND RESEARCH FACULTY AT VIRGINIA'S FOUR-YEAR PUBLIC INSTITUTIONS

JLARC staff conducted a survey of all teaching and research faculty (including research-only faculty but excluding clinical faculty, adjunct faculty, and teaching assistants) at Virginia's public four-year higher education institutions. Faculty were asked about their work activities during the 2013 fall semester; the balance among teaching, research, and service responsibilities; and their compensation and job satisfaction. A total of 4,605 faculty, responded to the survey, an estimated 41 percent response rate based on FY 2012 headcounts for tenured, tenure-track, and non-tenure-track T&R and research faculty provided by institutions.

REVIEW OF INSTITUTIONAL STUDIES AND RESEARCH LITERATURE

Through the course of the study, JLARC staff conducted a review of literature pertaining to faculty compensation, faculty workloads, instructional technology, academic program costs and instructional expenditures, the cost of faculty research activities, and the cost of higher education facilities. The study team also consulted SCHEV reports on institutional peer groups, facility utilization, prior faculty activity surveys, and institutional policies on adjuncts. JLARC staff relied upon the advice of several experts in the field of higher education in order to identify relevant literature, and also used Internet searches to identify material of interest to the study team.

JLARC staff also requested and reviewed documentation from institutions on these topics, including institutional policies or studies. All institutions responded to the document request, although some institutions stated that they did not have any relevant documents in several requested areas.

CASE STUDIES OF SELECTED FACULTY MEMBERS

To supplement its analysis of faculty activities, JLARC staff obtained detailed case study information for four teaching and research faculty members at Virginia's public four-year institutions. Faculty members were chosen to reflect the range of institutional missions and disciplines. These faculty members provided written descriptions or schedules of their typical weekly activities.

Appendix C

Discipline-Level Salary Benchmarking

JLARC staff compared salaries at Virginia's institutions in twelve academic disciplines to national benchmarks using CUPA-HR and OSU salary survey data. JLARC staff were unable to report CUPA-HR average salaries since they are proprietary information. As a result, JLARC staff assessed average salaries of Virginia's Master's and Baccalaureate institutions according to whether they fell below average salaries, fell between the average salary and a 10 percent range above the average salary, or fell above this range. JLARC staff were able to report OSU average salaries for each discipline, however, and those are included on the tables for the Research institutions.

BACCALAUREATE INSTITUTIONS

Table C-1: UVA's College at Wise – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

	Full Professors		Associate Professors		Assistant Professors	
Academic Discipline	UVA-W Average Salary	Compared to Carnegie Average	UVA-W Average Salary	Compared to Carnegie Average	UVA-W Average Salary	Compared to Carnegie Average
Computer sciences	n/a		$75,000	Below	$80,900	Above
Education	$81,467	Similar	72,500	Above	n/a	
Engineering	n/a		95,100	Above	74,500	Above
English	69,700	Below	55,833	Below	44,000	Below
Biological sciences	n/a		56,050	Below	46,600	Below
Mathematics/stats	n/a		48,800	Below	46,800	Below
Physical sciences	87,500	Similar	53,300	Below	48,000	Below
Psychology	46,575	Below	59,950	Below	n/a	
Social sciences	75,533	Below	59,700	Below	59,000	Similar
V&P arts	75,300	Below	52,533	Below	n/a	
Health	n/a		97,150	Above	n/a	
Business	88,400	Below	71,500	Below	n/a	

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Baccalaureate.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-2: Virginia Military Institute – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	VMI Average Salary	Compared to Carnegie Average	VMI Average Salary	Compared to Carnegie Average	VMI Average Salary	Compared to Carnegie Average
Engineering	$94,205	Similar	$69,300	Below	$64,950	Similar
English	76,309	Below	60,699	Similar	46,500	Below
Biological sciences	92,306	Above	n/a		51,363	Below
Mathematics/stats[a]	86,158	Similar	60,699	Below	57,417	Similar
Physical sciences	88,094	Similar	61,909	Below	n/a	
Psychology	71,389	Below	55,421	Below	47,952	Below
Social sciences	92,469	Similar	62,388	Below	50,300	Below
Business[b]	101,287	Above	85,940	Above	78,333	Above

[a]VMI data includes computer science faculty.
[b]VMI data includes economics faculty.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Baccalaureate. VMI does not have faculty in visual and performing arts or health. VMI reported only adjunct faculty in education.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

MASTER'S INSTITUTIONS

Table C-3: Christopher Newport University Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	CNU Average Salary	Compared to Carnegie Average	CNU Average Salary	Compared to Carnegie Average	CNU Average Salary	Compared to Carnegie Average
Computer sciences	$93,749	Below	$85,941	Similar	n/a	
Engineering	n/a		92,275	Above		
English	90,811	Above	67,108	Similar	57,273	Above
Biological sciences	89,540	Above	66,901	Similar	58,356	Similar
Mathematics/stats	95,988	Above	n/a		59,211	Similar
Physical sciences	94,210	Above	77,405	Above	58,717	Similar
Psychology	98,795	Above	68,636	Similar	56,450	Similar
Social sciences	84,878	Similar	68,619	Similar	54,560	Below
V&P arts	87,460	Above	65,487	Similar	53,236	Similar
Business[a]	109,766	Similar	94,560	Similar	88,394	Similar

[a]CNU data includes economics faculty.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's. CNU does not have faculty in education or health.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-4: James Madison University – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	JMU Average Salary	Compared to Carnegie Average	JMU Average Salary	Compared to Carnegie Average	JMU Average Salary	Compared to Carnegie Average
Computer sciences	$99,649	Similar	$89,704	Similar	$82,000	Above
Education	76,136	Below	63,007	Below	57,465	Similar
Engineering	n/a		87,150	Similar	76,950	Similar
English	77,639	Below	57,554	Below	49,852	Below
Biological sciences	80,433	Similar	64,904	Similar	53,632	Below
Mathematics/stats	77,538	Below	62,312	Below	59,207	Similar
Physical sciences	84,763	Similar	64,930	Similar	58,132	Similar
Psychology	78,759	Below	61,344	Below	54,840	Similar
Social sciences	73,141	Below	56,028	Below	51,600	Below
V&P arts	78,629	Similar	55,791	Below	49,455	Below
Health	90,566	Similar	67,600	Below	59,447	Below
Business[a]	102,968	Similar	99,016	Above	91,512	Similar

[a]JMU data includes economics faculty.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-5: Longwood University – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	LU Average Salary	Compared to Carnegie Average	LU Average Salary	Compared to Carnegie Average	LU Average Salary	Compared to Carnegie Average
Computer sciences	$95,084	Below	$71,000	Below	$63,000	Below
Education	78,279	Below	58,788	Below	57,084	Similar
English	74,351	Below	53,101	Below	48,075	Below
Biological sciences	n/a		58,216	Below	49,800	Below
Mathematics/stats	74,798	Below	55,269	Below	56,988	Similar
Physical sciences	66,957	Below	58,196	Below	50,913	Below
Psychology	82,627	Similar	55,740	Below	52,000	Below
Social sciences	81,780	Below	66,067	Below	51,442	Below
V&P arts	70,827	Below	53,528	Below	47,760	Below
Health	77,051	Below	73,866	Similar	55,754	Below
Business	103,664	Similar	85,752	Below	92,420	Above

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's. LU does not have faculty in engineering.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-6: Norfolk State University – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	NSU Average Salary	Compared to Carnegie Average	NSU Average Salary	Compared to Carnegie Average	NSU Average Salary	Compared to Carnegie Average
Computer sciences	$95,480	Below	$90,004	Similar	$75,705	Similar
Education	78,475	Below	62,214	Below	58,903	Similar
Engineering	110,648	Similar	84,395	Similar	80,000	Above
English	71,991	Below	58,710	Below	50,328	Below
Biological sciences	82,764	Similar	64,726	Similar	60,374	Above
Mathematics/stats	71,550	Below	61,682	Below	59,186	Similar
Physical sciences	89,741	Similar	71,458	Above	57,906	Similar
Psychology	81,764	Similar	70,201	Similar	59,667	Similar
Social sciences	87,271	Similar	59,896	Below	54,836	Below
V&P arts	68,237	Below	73,982	Above	53,610	Similar
Health	99,626	Above	66,100	Below	67,089	Similar
Business[a]	95,427	Below	91,518	Similar	68,856	Below

[a]NSU data includes economics faculty.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-7: Radford University – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	RU Average Salary	Compared to Carnegie Average	RU Average Salary	Compared to Carnegie Average	RU Average Salary	Compared to Carnegie Average
Computer sciences	$105,550	Above	$91,631	Above	$84,825	Above
Education	73,628	Below	58,682	Below	53,779	Below
English	66,499	Below	53,825	Below	44,715	Below
Biological sciences	65,554	Below	54,952	Below	51,214	Below
Mathematics/stats	71,752	Below	57,747	Below	50,219	Below
Physical sciences	71,057	Below	59,590	Below	52,638	Below
Psychology	71,546	Below	57,805	Below	53,967	Below
Social sciences	80,905	Below	66,239	Below	54,309	Below
V&P arts	71,866	Below	56,025	Below	49,749	Below
Health	89,165	Similar	75,478	Similar	66,658	Similar
Business	111,711	Similar	96,773	Similar	93,613	Above

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's. RU does not have faculty in engineering.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-8: University of Mary Washington – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

	Full Professors		Associate Professors		Assistant Professors	
Academic Discipline	UMW Average Salary	Compared to Carnegie Average	UMW Average Salary	Compared to Carnegie Average	UMW Average Salary	Compared to Carnegie Average
Computer sciences	101,715	Similar	88,121	Similar	73,338	Similar
Education	71,393	Below	56,045	Below	53,032	Below
English	79,577	Similar	56,793	Below	51,447	Below
Biological sciences	85,124	Similar	61,072	Below	51,813	Below
Mathematics/stats	74,711	Below	69,769	Similar	57,500	Similar
Physical sciences	84,346	Similar	60,247	Below	51,375	Below
Psychology	83,239	Similar	63,612	Below	51,750	Below
Social sciences	79,779	Below	61,223	Below	54,099	Below
V&P arts	83,253	Similar	62,187	Similar	48,917	Below
Business	86,400	Below	73,179	Below	72,902	Below

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's. UMW does not have faculty in engineering or health.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

Table C-9: Virginia State University – Discipline-Level Salary Benchmarking CUPA-HR Data (2011-12)

	Full Professors		Associate Professors		Assistant Professors	
Academic Discipline	VSU Average Salary	Compared to Carnegie Average	VSU Average Salary	Compared to Carnegie Average	VSU Average Salary	Compared to Carnegie Average
Computer sciences	$120,280	Above	$73,734	Below	$65,093	Below
Education	85,446	Similar	121,489	Above	65,094	Above
Engineering	98,509	Below	75,941	Below	121,118	Above
English	76,917	Below	58,074	Below	50,725	Below
Biological sciences	118,914	Above	69,271	Similar	59,883	Above
Mathematics/stats	75,340	Below	65,931	Similar	54,030	Below
Physical sciences	67,592	Below	74,924	Above	64,650	Above
Psychology	68,141	Below	62,960	Below	61,433	Above
Social sciences	82,379	Below	63,368	Below	62,516	Above
V&P arts	82,659	Similar	65,077	Similar	56,294	Similar
Health	n/a		86,288	Above	65,755	Similar
Business	110,209	Similar	84,559	Below	78,461	Below

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Master's.

Source: JLARC staff analysis of institutionally reported data and salary data provided by CUPA-HR.

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Table C-10: College of William and Mary – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	CWM Average Salary	Carnegie Average	CWM Average Salary	Carnegie Average	CWM Average Salary	Carnegie Average
Computer sciences	$120,531	$136,833	$108,334	$101,390	$95,522	$87,137
Education	97,135	104,190	77,756	73,064	66,465	61,268
English	98,330	108,411	74,277	71,994	49,156	58,703
Biological sciences	97,674	120,581	75,678	81,778	60,975	69,684
Mathematics/stats	108,772	114,970	79,862	79,333	63,653	69,864
Physical sciences	103,293	121,589	77,060	80,868	69,177	70,510
Psychology	93,207	117,497	68,713	76,355	57,599	65,659
Social sciences	109,940	126,092	73,405	82,435	66,507	70,835
V&P arts	90,370	94,148	68,415	67,627	50,304	55,013
Business	149,577	165,130	134,629	127,107	141,719	126,930

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral. CWM does not have faculty in engineering or health.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Table C-11: George Mason University – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	GMU Average Salary	Carnegie Average	GMU Average Salary	Carnegie Average	GMU Average Salary	Carnegie Average
Computer sciences	$149,697	$136,833	$98,611	$101,390	$82,440	87,137
Education	111,719	104,190	78,162	73,064	65,014	61,268
Engineering	136,598	134,653	104,507	95,024	84,258	81,986
English	94,514	108,411	71,493	71,994	52,282	58,703
Biological sciences	145,335	120,581	79,126	81,778	58,184	69,684
Mathematics/stats	103,139	114,970	85,261	79,333	60,400	69,864
Physical sciences	125,409	121,589	79,283	80,868	60,727	70,510
Psychology	127,675	117,497	84,846	76,355	71,051	65,659
Social sciences	133,161	126,092	84,104	82,435	70,230	70,835
V&P arts	93,476	94,148	66,546	67,627	60,900	55,013
Health	134,168	126,438	88,512	90,112	77,712	77,115
Business	161,718	165,130	127,373	127,107	121,777	126,930

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Table C-12: Old Dominion University – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	ODU Average Salary	Carnegie Average	ODU Average Salary	Carnegie Average	ODU Average Salary	Carnegie Average
Computer sciences	$140,122	$136,833	$94,170	$101,390	$74,800	87,137
Education	94,844	104,190	70,725	73,064	58,196	61,268
Engineering	112,505	134,653	82,328	95,024	73,427	81,986
English	84,608	108,411	59,507	71,994	55,113	58,703
Biological sciences	100,097	120,581	73,342	81,778	69,890	69,684
Mathematics/stats	102,448	114,970	68,836	79,333	68,143	69,864
Physical sciences	118,608	121,589	76,261	80,868	63,209	70,510
Psychology	97,295	117,497	79,127	76,355	72,714	65,659
Social sciences	101,730	126,092	76,664	82,435	60,101	70,835
V&P arts	105,532	94,148	61,333	67,627	50,333	55,013
Health	100,106	126,438	90,665	90,112	65,571	77,115
Business	130,297	165,130	77,446	127,107	59,980	126,930

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Table C-13: University Of Virginia – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	UVA Average Salary	Carnegie Average	UVA Average Salary	Carnegie Average	UVA Average Salary	Carnegie Average
Computer sciences	$145,397	$136,833	$93,727	$101,390	$87,555	87,137
Education	110,661	104,190	76,233	73,064	67,622	61,268
Engineering	135,282	134,653	97,003	95,024	82,173	81,986
English	113,398	108,411	76,046	71,994	62,850	58,703
Biological sciences	138,524	120,581	80,656	81,778	71,043	69,684
Mathematics/stats	109,982	114,970	79,943	79,333	75,500	69,864
Physical sciences	122,737	121,589	80,918	80,868	71,767	70,510
Psychology	124,404	117,497	77,878	76,355	74,848	65,659
Social sciences	139,213	126,092	78,643	82,435	77,430	70,835
V&P arts	92,508	94,148	71,031	67,627	55,667	55,013
Health	144,540	126,438	104,438	90,112	71,952	77,115
Business	186,722	165,130	154,891	127,107	125,564	126,930

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Table C-14: Virginia Commonwealth University – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	VCU Average Salary	Carnegie Average	VCU Average Salary	Carnegie Average	VCU Average Salary	Carnegie Average
Engineering	$136,134	$134,653	$91,331	$95,024	$79,674	$81,986
Mathematics/stats	96,286	114,970	63,798	79,333	61,453	69,864
Chemistry[a]	105,600	124,877	74,749	79,476	52,374	68,713
Physics[a]	150,137	115,988	$73,668	80,134	64,221	70,797
Psychology	115,665	117,497	74,644	76,355	54,090	65,659
V&P arts	85,616	94,148	65,108	67,627	51,360	55,013

[a]VCU was unable to report average salaries for the entire discipline of Physical Sciences.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral. VCU was able to report faculty salary expenditures only for the above disciplines.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Table C-15: Virginia Tech – Discipline-Level Salary Benchmarking OSU Data (2011-12)

Academic Discipline	Full Professors		Associate Professors		Assistant Professors	
	VT Average Salary	Carnegie Average	VT Average Salary	Carnegie Average	VT Average Salary	Carnegie Average
Computer sciences	$122,589	$136,833	$92,469	$101,390	$87,510	87,137
Education	103,525	104,190	73,000	73,064	60,677	61,268
Engineering	133,225	134,653	92,507	95,024	82,334	81,986
English	105,529	108,411	70,895	71,994	56,658	58,703
Biological sciences	102,457	120,581	76,465	81,778	69,842	69,684
Mathematics/stats	113,652	114,970	76,554	79,333	74,064	69,864
Physical sciences	122,321	121,589	75,355	80,868	68,721	70,510
Psychology	130,431	117,497	66,379	76,355	72,420	65,659
Social sciences	113,494	126,092	70,177	82,435	62,970	70,835
V&P arts	90,201	94,148	71,107	67,627	54,005	55,013
Health[a]	110,568	114,232	89,011	90,517	79,032	79,792
Business	153,804	165,130	116,055	127,107	133,631	126,930

[a]VT and OSU data are for veterinary faculty only.

Note: Average salaries are for full-time tenured, tenure-track, and non-tenure-track faculty and are normalized to a 9/10 month contract length. Average salaries have not been adjusted for inflation. Carnegie group was Doctoral.

Source: JLARC staff analysis of institutionally reported data and OSU salary survey data.

Appendix D

Select Virginia Faculty Survey Results

This appendix presents select results from the JLARC staff survey of teaching and research faculty. These results include faculty salary satisfaction, opinions on the competitiveness of faculty salaries, and faculty activities in spring 2013. See Appendix B for more information on the survey.

Table D-1: T&R Faculty Satisfaction With Personal Salary

Institution	Very Satisfied	Satisfied	Not Satisfied
RU	2.2%	25.3%	72.5%
LU	1.9	26.9	71.2
UMW	2.5	26.3	71.2
JMU	2.2	27.3	70.5
NSU	4.7	25.0	70.3
VMI	4.7	28.8	67.5
ODU	3.5	32.1	64.5
VCU	4.8	31.3	64.0
UVA-W	8.0	30.0	62.0
CWM	4.3	34.0	61.8
GMU	5.8	34.2	60.0
VSU	2.6	42.1	55.3
CNU	5.9	40.0	54.1
UVA	9.1	39.7	51.2
VT	4.6	45.8	49.6
Statewide	**4.9%**	**35.3%**	**59.8%**

Table D-2: T&R Faculty Satisfaction With Personal Salary for Select Faculty Ranks

	Full Professors			Associate Professors			Assistant Professors		
	Very Satisfied	Satisfied	Not Satisfied	Very Satisfied	Satisfied	Not Satisfied	Very Satisfied	Satisfied	Not Satisfied
CNU	0.0%	68.0%	32.0%	8.2%	32.7%	59.2%	8.7%	26.1%	65.2%
CWM	3.6	37.8	58.6	3.9	29.9	66.2	7.6	32.1	60.4
GMU	12.6	39.9	47.6	3.5	29.2	67.4	1.3	33.8	64.9
JMU	3.9	28.1	68.0	2.6	25.6	71.8	0.0	28.6	71.4
LU	8.3	25.0	66.7	0.0	26.3	73.7	0.0	29.4	70.6
NSU	5.9	17.7	76.5	11.8	29.4	58.8	0.0	26.1	73.9
ODU	5.3	27.6	67.1	2.6	30.8	66.7	1.9	42.3	55.8
RU	2.6	28.2	69.2	1.4	17.8	80.8	3.3	31.2	65.6
UMW	2.4	31.0	66.7	2.1	18.8	79.2	4.0	32.0	64.0
UVA	12.1	37.6	50.3	3.1	37.3	59.6	10.5	54.7	34.7
UVA-W	0.0	27.3	72.7	11.8	29.4	58.8	15.4	46.2	38.5
VCU	6.5	36.6	57.0	3.2	32.6	64.2	6.1	26.8	67.1
VMI	1.0	2.4	67.4	9.1	27.3	63.6	4.0	24.0	72.0
VSU	10.0	60.0	30.0	0.0	41.4	58.6	0.0	30.0	70.0
VT	5.6	50.2	44.2	5.0	39.7	55.4	3.6	50.4	46.0
State	**7.2%**	**38.2%**	**54.6%**	**3.7%**	**31.8%**	**64.5%**	**3.8%**	**36.6%**	**59.7%**

Note, Tables D-1 and D-2: Data for Spring 2013. Numbers may not add due to rounding.

Source: 2013 JLARC staff survey of Virginia faculty.

Table D-3: Full-time T&R Faculty Satisfaction With Personal Salary by Academic Discipline, Spring 2013

Academic Discipline	Very Satisfied	Satisfied	Not Satisfied
Non-STEM-H			
Communication, journalism	3.5%	21.8%	74.7%
Liberal arts and sciences	4.5	23.6	71.9
Foreign languages	6.5	21.8	71.8
English	0.9	28.2	70.9
History	3.1	27.5	69.4
Philosophy/religious studies	1.3	29.5	69.2
Architecture	2.4	28.6	69.1
Education	4.2	27.9	67.8
Social sciences	3.3	29.5	67.2
Visual and performing arts	2.0	32.7	65.3
Psychology	8.4	33.1	58.4
Public admin., social services	4.2	37.5	58.3
Business	5.6	36.9	57.5
Legal professions	24.5	50.9	24.5
STEM-H			
Mathematics and statistics	3.7	40.9	55.5
Engineering	5.6	40.3	54.1
Physical sciences	4.4	42.8	52.8
Computer/info. sciences	5.7	41.9	52.4
Health professions	6.7	42.7	50.6
Biological/biomed. sciences	6.5	45.1	48.4
Agriculture	6.1	54.6	39.4
Multi-, inter-disciplinary	0.0	21.2	78.8
Other	5.6	34.0	60.5
Statewide	**5.0%**	**35.4%**	**59.7%**

Table D-4: Full-time T&R Faculty Opinions on Competitiveness of Salaries in Faculty Member's Discipline, Spring 2013

Institution	Very Competitive	Competitive	Not Competitive	Don't Know
LU	0.0%	3.9%	94.2%	1.9%
VMI	1.3	6.3	87.5	5.0
RU	0.4	8.7	87.4	5.9
UMW	0.9	6.8	86.4	5.9
JMU	0.7	12.3	82.3	4.7
CWM	0.4	13.0	81.2	5.4
VCU	0.7	17.2	75.0	7.1
NSU	0.0	21.5	73.9	4.6
VSU	0.0	21.3	73.3	5.3
GMU	1.7	21.6	69.6	7.1
UVA-W	5.9	25.5	68.6	0.0
ODU	0.8	24.2	68.1	6.9
UVA	2.1	26.8	64.4	6.7
VT	1.5	31.5	58.6	8.4
CNU	5.2	23.7	54.8	16.3
Statewide	**1.4%**	**20.8%**	**71.2%**	**6.6%**

Note, Tables D-3 and D-4: Data for Spring 2013. Numbers may not add due to rounding.

Source: 2013 JLARC staff survey of Virginia faculty.

Table D-5: Full-time T&R Faculty Opinions on Competitiveness of Salaries in Faculty Member's Discipline by Academic Discipline

Academic Discipline	Very Competitive	Competitive	Not Competitive	Don't Know
Non-STEM-H				
Liberal arts and sciences	0.0%	13.5%	83.2%	3.4%
Philosophy/religious studies	1.3	9.0	82.1	7.7
Communication, journalism	0.0	14.9	81.6	3.5
Foreign languages	1.6	9.6	80.8	8.0
History	1.3	13.8	80.0	5.0
English	0.0	12.3	79.4	8.3
Psychology	1.2	17.5	78.9	2.4
Social sciences	0.9	16.8	78.1	4.2
Visual and performing arts	0.7	15.3	73.3	10.7
Education	1.8	19.1	72.4	6.7
Architecture	2.4	23.8	71.4	2.4
Business	2.1	24.1	70.8	3.1
Public admin., social services	2.1	20.8	70.8	6.3
Legal professions	15.1	41.5	39.6	3.8
STEM-H				
Physical sciences	0.7	18.5	72.0	8.9
Health professions	1.9	20.3	69.6	8.3
Engineering	1.3	26.6	66.3	5.9
Computer/information sciences	4.0	24.8	64.8	6.4
Mathematics and statistics	0.6	24.9	64.2	10.3
Biological/biomedical sciences	0.3	29.4	62.6	7.7
Agriculture	1.5	37.3	47.8	13.4
Multi-, inter-disciplinary	0.0	6.1	84.9	9.1
Other	1.4	29.2	62.0	7.4
Statewide	**1.4%**	**20.8%**	**71.2%**	**6.6%**

Note: Data for Spring 2013. Numbers may not add due to rounding.

Source: 2013 JLARC staff survey of Virginia faculty.

Table D-6: Average Time That Full-Time Teaching and Research Faculty at Each Virginia Public Four-Year Institution Reported Spending on Activities, Spring 2013

Institution & Faculty Type	Average Number of Weekly Hours				Average % of Total Workweek		
	Teaching	Research	Service	All	Teaching	Research	Service
Research Institutions							
CWM							
All	28	18	8	54	52%	34%	14%
Tenured & Tenure-Track	27	19	8	55	50	35	15
Non-Tenure-Track	36	9	4	50	74	18	8
GMU							
All	28	18	8	54	52	32	16
Tenured & Tenure-Track	24	21	9	55	44	39	17
Non-Tenure-Track	38	7	6	51	74	13	12
ODU							
All	30	16	8	54	55	30	14
Tenured & Tenure-Track	26	19	8	54	48	36	15
Non-Tenure-Track	42	5	6	53	79	10	11
UVA							
All	24	22	9	55	43	40	17
Tenured & Tenure-Track	23	24	9	56	41	42	16
Non-Tenure-Track	27	14	10	51	54	28	19
VCU							
All	25	19	10	53	47	35	18
Tenured & Tenure-Track	22	22	10	54	40	41	18
Non-Tenure-Track	33	10	9	52	63	19	18
VT							
All	25	21	8	55	47	38	15
Tenured & Tenure-Track	23	23	9	55	42	41	16
Non-Tenure-Track	37	9	5	51	73	18	9
Master's Institutions							
CNU							
All	35	12	8	55	64	21	14
Tenured & Tenure-Track	33	13	8	54	62	23	15
Non-Tenure-Track	39	10	7	56	72	16	12
JMU							
All	31	11	10	53	60	21	19
Tenured & Tenure-Track	31	12	11	53	58	22	20
Non-Tenure-Track	34	7	7	48	71	14	15
LU							
All	38	7	10	55	69	13	18
Tenured & Tenure-Track	37	7	11	55	68	13	19
Non-Tenure-Track	41	7	8	56	73	11	15
NSU							
All	34	12	8	54	64	22	14
Tenured & Tenure-Track	32	14	8	54	61	24	15
Non-Tenure-Track	41	7	6	54	77	12	11
RU							
All	35	10	11	55	63	17	20
Tenured & Tenure-Track	34	10	11	56	61	18	20
Non-Tenure-Track	41	4	6	51	81	8	11

Institution & Faculty Type	Average Number of Weekly Hours				Average % of Total Workweek		
	Teaching	Research	Service	All	Teaching	Research	Service
UMW							
All	36	10	8	54	67	18	15
Tenured & Tenure-Track	36	10	8	54	67	18	15
Non-Tenure-Track	37	10	7	54	68	19	13
VSU							
All	33	12	8	53	63	22	16
Tenured & Tenure-Track	33	13	9	55	61	23	16
Non-Tenure-Track	32	8	6	45	72	16	12
Baccalaureate Institutions							
UVA-W							
All	36	8	7	51	72	15	13
Tenured & Tenure-Track	35	9	8	52	68	17	15
Non-Tenure-Track	39	2	3	44	90	4	6
VMI							
All	34	11	8	53	64	22	15
Tenured & Tenure-Track	34	11	8	54	64	21	15
Non-Tenure-Track	29	13	6	48	62	26	11

Note: Data for Spring 2013, full-time teaching and research faculty. Numbers may not add due to rounding.

Source: 2013 JLARC staff survey of Virginia faculty.

Appendix E Percentage of Total Instruction Taught By Faculty Type at Each Institution

Table E-1: Percentage of Total Student Credit Hours Taught Institution-Wide by Faculty Type, Fall 2004 and 2010

Institution & Course Level	Tenured and Tenure-Track		Non-Tenure-Track		Supplemental		Teaching Assistants	
	2004	2010	2004	2010	2004	2010	2004	2010
Research Institutions								
CWM								
All	70%	63%	13%	20%	17%	17%	0%	0%
Lower[a]	64	53	22	30	13	17	0	0
Upper[a]	76	69	8	19	15	12	0	0
Graduate	70	72	5	6	26	22	0	0
GMU								
All	39	36	22	26	38	33	2	5
Lower[a]	27	25	28	30	42	38	3	8
Upper[a]	40	34	24	30	35	31	1	6
Graduate	56	57	8	13	35	30	0	0
ODU								
All	43	34	25	30	27	32	5	3
Lower[a]	26	20	31	33	35	44	8	4
Upper[a]	54	41	24	33	19	22	3	3
Graduate	60	64	12	11	27	24	1	1
UVA								
All	63	59	20	19	9	14	9	8
Lower[a]	53	48	24	25	5	13	18	14
Upper[a]	63	60	25	21	7	13	5	6
Graduate	74	71	9	11	15	16	1	1
VCU								
All	--	34	--	32	--	32	--	1
Lower[a]	--	24	--	38	--	36	--	2
Upper[a]	--	40	--	29	--	30	--	1
Graduate	--	51	--	22	--	27	--	0
VT								
All	59	52	15	16	22	26	5	6
Lower[a]	44	33	24	25	26	33	6	8
Upper[a]	74	67	4	8	17	20	6	4
Graduate	83	83	1	1	17	16	0	0
Master's Institutions								
CNU								
All	71	63	16	23	13	14	0	0
Lower[a]	65	55	20	27	15	18	0	0
Upper[a]	85	78	7	17	8	5	0	0
Graduate	98	73	1	5	1	22	0	0
JMU								
All	56	57	25	19	19	24	0	0
Lower[a]	48	49	30	22	22	30	0	0

Institution & Course Level	Tenured and Tenure-Track		Non-Tenure-Track		Supplemental		Teaching Assistants	
	2004	2010	2004	2010	2004	2010	2004	2010
Upper[a]	67	70	19	16	14	14	0	0
Graduate	75	66	8	14	16	20	0	0
LU								
All	63[b]	65	21[b]	14	15[b]	20	0[b]	0
Lower[a]	56[b]	60	27[b]	19	17[b]	21	0[b]	0
Upper[a]	74[b]	74	14[b]	9	12[b]	17	0[b]	0
Graduate	71[b]	50	9[b]	11	20[b]	40	0[b]	0
NSU								
All	48	53	46	39	6	7	0	0
Lower[a]	44	47	50	44	7	8	0	0
Upper[a]	59	64	36	29	5	7	0	0
Graduate	49	57	45	40	6	3	0	0
RU								
All	59	58	10	17	27	21	4	5
Lower[a]	47	46	12	19	33	27	7	8
Upper[a]	78	73	6	15	16	12	0	1
Graduate	75	74	7	12	18	14	0	0
Baccalaureate Institutions								
UVA-W								
All	57	53	28	25	15	22	0	0
Lower[a]	51	49	36	32	13	20	0	0
Upper[a]	66	59	15	16	19	25	0	0
Graduate	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
VMI								
All	69	65	11	2	20	32	0	0
Lower[a]	61	61	13	4	26	35	0	0
Upper[a]	80	71	7	0	12	29	0	0
Graduate	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Notes: (i) Data for a given course level and year at an institution may not add to 100 percent due to rounding. (ii) Data was unavailable for UMW or VSU. See Appendix B for more information. (iii) "n.a." is not applicable and "—" indicates data was not provided.
[a] Exclude undergraduate individual instruction course sections, which were not requested by course level.
[b] Fall 2007 data, the most recent data available.

Source: JLARC staff analysis of data provided by Virginia institutions, fall 2010.

Appendix F

Virginia's Capital Planning Process and Higher Education Capital Funding

Virginia's capital process is prescribed by the Code of Virginia and Appropriation Acts, and higher education institutions represent a substantial portion of capital spending in Virginia. Institutions reported a variety of funding sources for the construction and renovation of instructional and research facilities in recent years.

THE CAPITAL OUTLAY PROCESS IS INTENDED TO CONTROL DEBT, PROVIDE MORE DETAILED PROJECT PLANNING, AND REDUCE CAPITAL COSTS

The Code of Virginia and Appropriation Acts have established a six-year capital planning process for State capital budgeting (Table F-1). The process was implemented to encourage increased collaboration between the Governor and members of the General Assembly,

Table F-1: Key Dates and Actions in Capital Planning Process

April through Fall	State agencies and higher education institutions submit their six year capital requirements. Prior to the long session, in the fall of even-numbered years, agencies submit requests for emergency projects or to supplement projects with insufficient funds. In the fall of odd years agencies submit full six-year capital requests.
April – November	Six Year Capital Outlay Plan Advisory Committee (6PAC) reviews agency proposals, and provides recommendations for each project at the a) pre-planning, b) detailed planning, and c) commencement of project construction.
November	6PAC submits its recommendations to the Governor and Chairmen of the House Appropriations and Senate Finance Committees.
November	Governor submits the State six year capital outlay plan to the General Assembly.
December	Governor submits amendments to the six year capital outlay plan to the General Assembly.
Legislative Session	General Assembly session authorizes projects during each year's session.
Post-enactment	6PAC is required to meet quarterly to review projects and oversee distribution of bond proceeds.

Source: Virginia Department of Planning and Budget.

and to establish a more "business-like" approach for funding capital outlays. Higher education institutions, like all state agencies with physical plants, have been required to submit six-year capital outlay plans since the 1992-94 biennium. The purpose of six year capital outlay plans is to require agencies to justify their project requests based upon programmatic and other needs, to prioritize their capital requests, and facilitate long-term capital budget planning. In 2002 the six-year planning process was formalized, with the Governor required to submit a statewide six-year capital outlay plan and revisions annually.

Each April all state entities, including higher education institutions, are required to submit their six year capital requirements, which are then subject to review by the Six Year Capital Outlay Planning Advisory Committee (6PAC). The 6PAC is composed of the Secretary of Finance, the Director of the Department of Planning and Budget, the Director of DGS, the executive Director of SCHEV, and the staff directors of the House Appropriations Committee and the Senate Finance Committee. The 6PAC is charged with making project recommendations to the Governor and General Assembly each November. The Governor is required to submit a six year capital outlay plan to the General Assembly each November, with amendments included in the executive budget submitted to the General Assembly each December. The General Assembly is charged with granting final authorization for the amount of bonds sold, and the list of projects authorized to be funded through bond proceeds.

In 2008, the 6PAC, pooled funding, and additional project planning process were established. 6PAC was established to oversee the capital planning process, and each year is required to submit to the Governor and Chairmen of the House Appropriations Committee and Senate Finance Committee a proposal specifying new and previously authorized projects that should receive general fund-supported debt resources. 6PAC's recommendations are based upon requests submitted by agencies—including higher education institutions—in the six year plans following review by and consultation with the Department of General Services (DGS), the Department of Planning and Budget (DPB), and SCHEV. The Code also gives 6PAC a key role in the project-level planning process, by approving institutions' projects to use the Central Capital Planning Fund to engage in pre-planning, detailed planning, and value engineering processes to identify project scope, produce reliable cost estimates, and encourage project efficiencies.

The "pooled funding" approach was adopted to shorten the time between final project approval and the availability of funding, and to lower costs by increasing the competitiveness of the bidding process. The pooled funding approach establishes a global debt au-

thorization for all projects authorized in the State's six year capital plan, rather than at the project-level. The pooled process was intended to make the bidding process more competitive, as contractors would not know the amount authorized for individual projects.

FUNDING FOR CONSTRUCTION AND RENOVATION OF INSTRUCTIONAL AND RESEARCH FACILITIES CAME PRIMARILY FROM STATE-ISSUED DEBT AND INSTITUTIONAL FUNDS

The General Assembly approves the issuance of bonds on a project-by-project basis through the capital planning process. Borrowing funds by selling bonds allows the higher education institutions to use the State's high credit rating to obtain low interest rates and repay the cost of building a facility consistent with the long-term life of the facility (see Table F-2).

Three types of state debt have been used to finance the construction and renovation of projects containing instructional and research space at Virginia higher education institutions. These are:

- 9(b) general obligation bonds, which are issued for capital projects. They must be authorized by a majority vote of each house of the General Assembly and approved in a referendum by the citizens of the Commonwealth. General fund revenues of the Commonwealth are used to repay 9(b) bonds. Higher education institutions typically use such funds to support construction and renovations of E&G facilities.
- 9(c) debt, which is incurred for revenue-producing capital projects. Both the revenues of the projects and the full faith and credit of the Commonwealth back 9(c) debt. Authorization of 9(c) debt requires a two-thirds vote of each house of the General Assembly and certification by the Governor that anticipated net revenues will be sufficient to meet principal and interest payments on the debt. Higher education institutions use proceeds of these bond sales to construct and renovate auxiliary enterprise facilities such as dormitories and recreation centers.
- 9(d) debts, which are issued when the Commonwealth is not committed to repayment of the debt, and its full and faith and credit do not back the bonds. Three types of 9(d) debt are issued for projects at higher education institutions. The Virginia College Building Authority (VCBA) issues 9(d) bonds to finance projects for public higher education institutions through its pooled bond program and the 21st Century bond program. For the pooled financing program, VCBA issued bonds and buys notes issued by the institutions. Payments made by the institutions on their notes from institutional funds are used by the

Table F-2 Three Types of State Debt Used for Higher Education Construction and Renovation Projects

Type of debt	Approval	Recent activity	Repaid by
9(b) General Obligation Bonds	General Assembly, governor, voters	In 2002, voters approved $900 million	State taxpayers
9(c) Revenue Bonds	2/3 vote of General Assembly, governor	Since 2006 Virginia has authorized $1.3 billion for higher education institutions	Project users
9(d) Revenue Bonds	General Assembly and governor authorize VCBA to issue bonds and appropriate funds for debt service	As of FY 2012, VCBA had $3.5 billion in bonds outstanding	General revenue of institution (may include State general funds, student fees, other revenues)

Note: Level III institutions are authorized by Code to issue certain debt without prior General Assembly approval.

Source: Constitution of Virginia, Department of Treasury.

VCBA to repay its bonds. The VCBA 21st Century program provides institutions with funding for capital projects. Payments for 21st Century bonds are primarily funded by general fund dollars appropriated by the General Assembly in addition to other institutional revenues. Higher education section 9(d) debt may also be issued by institutions individually based on their own credit. For higher education institutions, 9(d) debt supports the construction and renovation of a variety of facilities, including those containing instructional and research space.

Institutions reported that state-issued debt and other sources of funds were used to fund the construction and renovation of facilities. Construction of facilities containing instructional and research space was funded primarily by State and institutional debts, with VCBA 21st Century Bonds, 9(b), 9(c), and other 9(d) debt representing 77 percent of construction expenditures between FY 2005 and FY 2012 (Table F-3). Non-debt sources included institutional revenues (19 percent), private funds (1.5 percent) and State General Funds (2.4 percent).

Renovation was primarily funded by institutional resources and General Obligation (9b) debt (Table F-4). Together, these represented 70 percent of total renovation expenditures on instructional and research facilities between FY 2005 and FY 2012. Other debt sources commonly reported were VCBA 21st Century, 9(c) debt, and 9(d) debt (25 percent). General funds and private funds represented the remaining 4.5 percent of renovation expenditures for the period.

Table F-3: Institutions Report Several Substantial Funding Sources for the Construction of Instructional and Research Space (FY 2005 to FY 2012, $ in Millions)

Institution	Institutional funds	9(d), VCBA 21st Century	9(b) Debt	9(c) Debt	Other 9(d) Debt	Private funds	General funds	Total
CNU	-	162.3	-	-	-	-	-	**162.3**
CWM	0.2	-	56.7	-	100.5	18.6	1.2	**177.3**
GMU	4.8	-	-	187.9	115.5	-	-	**308.3**
JMU	0.3	63.3	70.0	-	-	10.0	20.9	**164.5**
LU	-	33.6	7.3	-	1.7	-	0.6	**43.0**
NSU	-	21.8	26.2	-	-	-	-	**48.0**
ODU	6.9	46.8	19.1	-	22.8	6.7	6.5	**108.9**
RU	8.4	-	55.2	-	-	-	-	**63.6**
UMW	-	-	14.6	-	-	-	-	**14.6**
UVA	358.5	47.1	36.9	-	328.3	-	-	**770.9**
UVA-Wise	-	-	62.6	-	-	49.4	-	**67.6**
VCU	28.6	42.7	28.3	-	41.4	-	16.3	**157.1**
VMI	-	-	15.1	-	2.2	-	-	**17.3**
VT	34.6	-	157.8	-	98.9	-	10.3	**301.6**
Total	**$442.2**	**$426.8**	**$549.8**	**$187.9**	**$711.3**	**$40.2**	**$55.8**	**$2,414.0**

Note: Numbers may not add due to rounding. VSU did not provide data on fund sources for construction expenditures.

Source: JLARC analysis of institutional data.

Table F-4: A Variety of Fund Sources Were Used to Fund Renovation of Instructional and Research Facilities (FY 2005 to FY 2012, $ in Millions)

Institution	Institutional funds	9(d), VCBA 21st Century	9(b) Debt	9(c) Debt	Other 9(d) debt	Private funds	General funds	Total
CNU	-	3.0	-	-	0.9	-	-	**3.9**
CWM	1.9	-	22.4	-	27.4	14.3	2.5	**68.7**
GMU	0.2	-	-	20.8	-	-	-	**21.0**
JMU	3.9	6.3	13.9	-	-	-	2.7	26.8
LU	1.6	14.4	-	-	-	0.6	0.7	**17.3**
NSU	-	15.2	-	-	-	-	-	15.2
ODU	-	5.3	26.3	-	-	0.4	2.8	**34.7**
RU	0.7	-	14.1	-	-	-	-	**14.8**
UMW	1.3	-	18.6	-	-	-	-	**19.9**
UVA	345.3	14.5	7.2	-	50.7	-	-	**417.7**
UVA-Wise	0.02	-	11.1	-	-	1.0	-	**12.1**
VCU	16.8	27.2	10.2	-	4.3	-	6.4	**64.9**
VMI	1.2	-	50.9	-	-	-	-	**52.1**
VT	33.7	-	18.9	-	4.3	-	6.0	**63.1**
Total	**$406.7**	**$100.0**	**$179.5**	**$20.8**	**$87.6**	**$16.4**	**$21.3**	**$832.2**

Note: Numbers may not add due to rounding. VSU did not provide data on fund sources for renovation.

Source: JLARC staff analysis of institutional data.

Appendix G

Initiatives to Reduce Space-Related Costs at Virginia's Institutions

Institutional staff provided JLARC staff with the following examples of initiatives to reduce operation and maintenance (O&M) costs, renovate existing facilities, and increase space utilization through centralized space management, design flexibility, and internal guidelines.

MOST INSTITUTIONS HAVE TAKEN STEPS TO IMPROVE SPACE UTILIZATION AND REDUCE FACILITIES-RELATED COSTS

Virginia's four-year institutions have implemented a variety of measures to reduce their facilities-related costs and improve their utilization of instructional and research space.

Initiatives to Reduce Facilities-Related Costs Focus on Reducing O&M Costs and Renovating Existing Facilities Where Possible

Institutional initiatives to reduce facilities-related costs often focus on O&M expenditures, guided in part by State policy. Virginia currently recommends Leadership in Energy and Environmental Design (LEED) Silver for new facilities (see sidebar). Some institutions, however, are building to either LEED Gold or LEED Platinum standards to improve building operations and reduce energy consumption. For example, CWM's School of Education received LEED Gold certification in 2010 due in part to a 20.8 percent reduction in energy consumption and 30.5 percent reduction in the use of potable water compared to a non-LEED building of similar size. UVA-Wise received LEED Platinum for the renovation of its Science Center due in part to its use of solar panels, which offset six percent of the building's energy consumption and represents a 26 percent reduction in energy use compared to a non-LEED similar sized facility.

Leadership in Energy and Environmental Design (LEED)
The U.S. Green Building Council offers LEED certification, which verifies that a facility was designed and built using strategies targeting high performance in several areas, including water savings, energy efficiency, and indoor environmental quality. A facility's receives a LEED certification (Certified, Silver, Gold, or Platinum) after its use of these strategies is reviewed.

Source: U.S. Green Building Council

Several institutions identified metering of individual buildings as a potential method to control O&M expenditures, as opposed to monitoring utilities at the campus level. For example, VT currently meters some individual buildings to provide feedback on lowering energy costs and is considering incorporating sub-metering into the budget process. VMI has fully-implemented sub-metering and has installed a centralized energy management and control center to identify low-efficiency spaces in order to focus resources on reducing energy use. UVA staff stated that they are moving toward a new financial model that will make individual departments

responsible for utility and operating costs. They believe it will force departments to think critically about space needs and will incentivize them to save funds. Any funding saved on O&M in their proposed model would be returned to the department for other purposes.

Another approach to reducing facilities-related costs is to renovate existing space. For example, ODU staff prioritized renovation over construction of new space to avoid increased O&M costs from additional facilities and repurpose existing space to conform to changing pedagogies and shifting enrollments among disciplines. Staff at UVA described an initiative to "retro-commission" older facilities by rehabilitating them and making upgrades for energy efficiency. Although UVA had allocated funds for this initiative, staff reported that they have been able to support the replacement of older systems through the savings realized from the program thus far.

Some institutions have also turned to leased space to realize cost efficiencies. ODU has undergone a significant growth in sponsored research activity over the past several years and is meeting demand for research space through space in the Innovation Research Park. ODU's Real Estate Foundation leases the land to Wexford Science and Technology, which designed and operates the research facilities and leases them to ODU. ODU's Provost and VP for Research allocate leased space based upon grant support and faculty demand. Staff note that this arrangement allows faculty to have access to scientific space without the initial and long-term operational costs of building institutional research space.

Conversely, VT reviewed its use of leased space in 2008 and identified opportunities for cost-savings through non-renewal of leases that were expiring soon, amounting to approximately $188,000 annually. VT was also able to reallocate personnel located in or events held at leased space to on-campus facilities or other off-campus space to reduce the amount of leased space it needed, amounting to cost savings of $44,000 annually.

Centralized Space Management Policies, Design Flexibility, and Strict Internal Utilization Guidelines Improve Space Utilization

Institutions in Virginia and elsewhere have undertaken many initiatives to improve their instructional and research space utilization. In addition to improving efficiency, these initiatives often provide ancillary benefits for students by providing more options for courses throughout the day and across the week.

Centralizing Classroom Scheduling Generally Improves Space Utilization. Through centralized scheduling, administrators are able to assign classrooms and laboratories to courses offered by

multiple departments. Additionally, central scheduling increases the number of hours per week that a room may be in use. A review by the Arizona Office of the Auditor General in the late 1990s found that classrooms scheduled centrally had higher utilization rates than classrooms scheduled by departments or academic colleges. The report also cited ODU as an example of improved utilization due to a move to central scheduling.

In addition to ODU, several other Virginia institutions cited centralized scheduling as a tool to improve space utilization. For example, RU recently implemented software that allows staff to maximize utilization by matching scheduled courses with rooms that best meet space needs and technology requirements. Staff can also identify scheduling "bottlenecks," or room shortages during a desired time period, and rearrange courses to distribute more evenly throughout the day and week. Staff attributed a one percent increase in utilization to centralized scheduling management, even after opening the College of Business and Education building.

Another institution is turning its greater use of internet technology into space efficiencies. GMU is testing out "nested" scheduling for hybrid courses (courses with online and in-class components). Nesting allows staff to schedule multiple hybrid courses to meet in the same classroom throughout the week. For example, a traditional course may meet from 10-11am on Mondays, Wednesdays, and Fridays. Nesting hybrid courses allows GMU to schedule one hybrid course from 10-11am on Monday, another from 10-11am on Wednesday, and a third from 10-11am on Friday—all in the same classroom space. Staff noted that the approach does require additional coordination across their 11 colleges and with the registrar's office, and they are currently evaluating this approach to see if it can be scaled and expanded to other areas.

Some institutions have centrally implemented restrictions or policies related to the number or percentage of courses a department may offer during a certain block of time. GMU implemented policies aimed at increasing Friday utilization, more evenly distributing course offerings throughout the week, and increasing early morning and late afternoon course offerings. CNU staff also mentioned using similar practices, requiring departments to schedule courses across the entire range of available time slots before scheduling multiple courses during the same time slots.

Institutions in other states have also sought to increasing utilization during times that are traditionally under-utilized. Faced with state budget cuts that would have required a 20 percent tuition increase to cover its operating budget, New Jersey's Kean University (KU) targeted low utilization of instructional space on Friday afternoons and Saturdays (11 percent and 8 percent, respectively).

By increasing the number of courses offered during Friday afternoons and Saturdays, KU improved utilization to 50 percent and 16 percent, respectively. Increased utilization of instructional space allowed KU to accommodate an additional 700 students without building new facilities and to moderate its tuition increase to five percent. Students also benefited from some of these savings, as KU offered course discounts up to 20 percent to students enrolled in courses offered on Friday afternoons and Saturdays.

Experts commonly point to a territoriality among departments regarding their classrooms and lab space as a contributor to low-utilization rates. Several Virginia institutions mentioned changing the culture surrounding space to allow for scheduling in any space that best fits course or research purposes.

Virginia Institutions Have Also Improved Utilization By Increasing the Flexibility of Instructional or Research space. Institutions commonly design instructional space for specific programs or research space for specific faculty members' research agendas. Experts note space designed with specific needs in mind becomes more quickly dated and inflexible. In some cases, such as with nursing, institutions must design space to specifically fit programmatic needs and meet accreditation requirements. In other cases, however, institutions are seeking to increase space flexibility.

> ***JMU's Design Approach Aims To Maximize Space Use, Improve Quality of Student Learning, and Minimize Equipment Costs of New Facilities***
>
> *JMU's Biosciences building opened in fall 2012. Staff designed the facility using the idea of faculty "villages," which locate faculty offices in a cluster around common laboratory space, which is used for faculty and student research and classroom labs. In contrast to traditional designs, which locate faculty offices linearly along a hallway, the new design intended to encourage greater research collaboration among faculty and minimize costs by allowing greater sharing of expensive research equipment. JMU staff also emphasized the potential for increasing student collaboration among one another and with faculty members through an emphasis on interactive student learning that was incorporated into the building's design. For example, JMU designed larger classrooms to be flexible, allowing for group work that large lecture halls normally do not permit.*

CWM's Integrated Science Center III building, which recently opened, similarly emphasizes collaborations among faculty researchers and maximizes shared access to expensive research

equipment. The laboratories themselves are also designed to be flexible and can be easily transformed to adapt to the needs of multiple scientific disciplines.

Some Institutions Use Internal Guidelines And Incentives. At least one institution has developed a quantitative process to determine the point at which new classroom space is needed. ODU's internal process sets guidelines for when the institution should assess the need for more classroom space, begin to design additional space, and add new classrooms to their inventory, based upon ODU's classroom utilization (as measured by SCHEV's guidelines).

VCU is targeting utilization of its research space in the School of Medicine. Staff evaluate research space utilization according to internal financial productivity metrics, in a similar manner to SCHEV's guidelines. Institutional documentation notes that department chairs should give priority for space to PIs who are funded 30 percent above the School of Medicine median research awards per ASF. Additionally, faculty who are not actively engaged in sponsored research have one year to obtain external funding or they may lose use of the space.

Appendix H

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Appendix

Virginia Faculty Teaching Loads by Institution and Discipline

This appendix presents data on average faculty teaching loads for select disciplines at Virginia's public four-year institutions in the fall 2010 semester, including how the teaching loads changed over time and how they compare to the national average. Data is reported for each institution, excluding UMW and VSU for which data was unavailable. See Appendix B for more information.

Table I-1: CNU's Average Teaching Loads Per Faculty FTE, Fall 2010

	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
Discipline	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	243	0%	Above	387	n.a.	Above	372	27%	Above
Course Sections	3.4	-23%	Similar	4	n.a.	Similar	4	7%	Similar
Education									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Engineering									
SCHs	305	24%	Above[b]	n.a.	n.a.	n.a.	224	n.a.	Above[b]
Course Sections	4	–20%	Above[b]	n.a.	n.a.	n.a.	5.7	n.a.	Above[b]
English									
SCHs	210	2%	Similar	201	–18%	Below	171	13%	Below
Course Sections	3.4	–2%	Similar	3.7	–7%	Similar	3.8	43%	Similar
Biological Sciences									
SCHs	279	–31%	Above	262	53%	Similar	281	–32%	Above
Course Sections	4.1	–21%	Similar	4.3	–29%	Similar	6.4	6%	Above
Mathematics/Stats									
SCHs	335	3%	Above	500	7%	Above	498	40%	Above
Course Sections	3.4	–13%	Similar	4.5	13%	Above	4	10%	Similar
Physical Sciences									
SCHs	272	6%	Above	264	–27%	Similar	267	33%	Above
Course Sections	3.5	–5%	Similar	4.8	–4%	Similar	7.3	521%	Above
Chemistry									
SCHs	343	–9%	Above	256	–29%	Similar	275	6%	Above
Course Sections	3.8	–10%	Similar	4.5	–10%	Similar	12	100%	Above
Physics									
SCHs	187	–4%	Below	270	n.a.	Similar	263	127%	Above
Course Sections	3.2	–9%	Below	5	n.a.	Similar	4.4	–23%	Below
Psychology									
SCHs	279	–5%	Similar	246	n.a.	Below	265	–33%	Below
Course Sections	3.2	–13%	Similar	2	n.a.	Below	3	–24%	Below
Social Sciences[c]									
SCHs	270	–13%	Similar	265	–17%	Below	312	–4%	Similar
Course Sections	3.2	–12%	Similar	4.2	14%	Above	4.3	18%	Above
Economics[c]									

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Arts									
SCHs	183	–1%	Above	134	40%	Below	114	59%	Below
Course Sections	2.2	–12%	Below	2.5	275%	Below	1.4	123%	Below
Health									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Business[c]									
SCHs	178	–31%	Below	281	19%	Below	308	–5%	Similar
Course Sections	2.6	–28%	Below	3.6	13%	Similar	3.8	–4%	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable and "—" indicates data was not provided.
[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.
[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.
[c] CNU reported economics, which is a sub-discipline in social sciences, under business.

Source: JLARC staff analysis of data from CNU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-2: CWM's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	88	–6%	Below	365	–35%	Below	153	–60%	Below
Course Sections	1.7	8%	Below	2.5	–86%	Below	13	–55%	Above
Education									
SCHs	91	2%	Below	66	–9%	Below	137	–17%	Below
Course Sections	1.8	–17%	Below	5.5	175%	Above	3	–37%	Below
Engineering									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
English									
SCHs	98	–23%	Below	172	–7%	Below	214	–42%	Below
Course Sections	1.4	–23%	Below	2.8	–12%	Below	3.3	–39%	Similar
Biological Sciences									
SCHs	73	–1%	Below	187	695%	Below	104	36%	Below
Course Sections	1.1	–11%	Below	0.6	–40%	Below	5.6	79%	Above
Mathematics/Stats									
SCHs	124	17%	Below	392	30%	Below	435	–21%	Similar
Course Sections	1.8	–5%	Below	2.7	–11%	Below	3	–45%	Below
Physical Sciences									
SCHs	150	–12%	Below	205	–40%	Below	350	–10%	Below
Course Sections	1.4	–44%	Below	2.5	–17%	Below	16.1	71%	Above
Chemistry									
SCHs	220	–6%	Below	n.a.	n.a.	n.a.	325	–23%	Below
Course Sections	1.9	–51%	Below	n.a.	n.a.	n.a.	14.5	813%	Above
Physics									
SCHs	112	–10%	Below	33	n.a.	Below	215	–15%	Below
Course Sections	1.1	–38%	Below	1	n.a.	Below	29	144%	Above
Psychology									
SCHs	262	2%	Above	293	–19%	Below	160	–71%	Below
Course Sections	2.3	–15%	Above	4.3	–29%	Above	3	–63%	Below
Social Sciences									
SCHs	159	–17%	Below	262	33%	Below	224	–10%	Below
Course Sections	1.8	–12%	Below	2.7	11%	Below	3.2	1%	Below
Economics									
SCHs	200	–15%	Similar	435	32%	Below	177	n.a.	Below
Course Sections	1.7	–17%	Below	2.3	n.a.	Below	3	n.a.	Below
Arts									
SCHs	86	–36%	Below	151	–20%	Below	157	–24%	Below
Course Sections	2.1	–24%	Below	2.7	–19%	Below	3.3	–40%	Below
Health									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Business									
SCHs	164	18%	Below	247	103%	Below	383	–3%	Similar
Course Sections	1.7	–11%	Below	2.5	17%	Below	4.8	–43%	Above

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.
[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from CWM, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-3: GMU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	120	–19%	Below	312	–25%	Below	424	2%	Above
Course Sections	1.5	–24%	Below	3.6	37%	Below	4.1	–54%	Similar
Education									
SCHs	110	–2%	Below	184	51%	Similar	256	11%	Above
Course Sections	1.8	1%	Below	3	60%	Similar	4.8	6%	Above
Engineering									
SCHs	113	–16%	Below	189	46%	Below	278	–27%	Above
Course Sections	1.9	12%	Below	3.6	95%	Below	4.9	–27%	Above
English									
SCHs	114	–8%	Below	240	11%	Similar	252	2%	Similar
Course Sections	1.9	–2%	Similar	3.4	0%	Similar	4	0%	Similar
Biological Sciences									
SCHs	104	–25%	Below	679	11%	Above	626	–35%	Above
Course Sections	1.7	–5%	Below	2.6	–19%	Below	7.1	–50%	Above
Mathematics/Stats									
SCHs	212	–9%	Above	618	45%	Similar	447	17%	Similar
Course Sections	1.9	0%	Similar	2.9	–10%	Below	4.3	–27%	Above
Physical Sciences									
SCHs	179	3%	Below	345	–4%	Below	448	124%	Similar
Course Sections	1.7	–7%	Below	3.3	30%	Below	10.7	–28%	Above
Chemistry									
SCHs	346	51%	Above	578	123%	Below	194	–27%	Below
Course Sections	2.1	–6%	Below	3.5	17%	Below	7.8	–48%	Above
Physics									
SCHs	149	–2%	Below	234	–13%	Below	1010	537%	Above
Course Sections	2.2	54%	Similar	4.8	71%	Similar	17.5	–1%	Above
Psychology									
SCHs	119	34%	Below	359	47%	Below	556	11%	Above
Course Sections	1.7	59%	Below	2.8	24%	Below	4.9	–5%	Above
Social Sciences									
SCHs	194	15%	Below	320	–9%	Below	508	–10%	Above
Course Sections	1.7	9%	Below	2.6	0%	Below	4	0%	Similar
Economics									
SCHs	202	28%	Similar	701	–24%	Similar	650	–6%	Above
Course Sections	1.6	14%	Below	3.5	–13%	Similar	4	1%	Above
Arts									
SCHs	143	–29%	Similar	186	6%	Below	261	30%	Above
Course Sections	2.5	1%	Below	3.5	51%	Similar	4.2	–1%	Above
Health									
SCHs	106	–12%	Below	228	72%	Above	287	61%	Above
Course Sections	1.6	–20%	Below	2.2	8%	Below	4.9	12%	Above
Business									
SCHs	182	–9%	Below	689	13%	Above	550	7%	Above
Course Sections	1.7	–11%	Below	4.2	28%	Above	5.2	–15%	Above

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.
[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from GMU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-4: JMU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	215	7%	Above	351	25%	Above	370	7%	Above
Course Sections	3.2	–2%	Similar	3.3	0%	Below	3.6	–40%	Similar
Education									
SCHs	185	–6%	Similar	289	19%	Above	58	–47%	Below
Course Sections	4.7	–6%	Above	6.5	–24%	Above	2.7	–32%	Below
Engineering									
SCHs	70	n.a.	Below[b]	n.a.	n.a.	n.a.[b]	765	n.a.	Above[b]
Course Sections	2	n.a.	Below[b]	n.a.	n.a.	n.a.[b]	11.8	n.a.	Above[b]
English									
SCHs	172	–13%	Below	159	–24%	Below	271	20%	Above
Course Sections	3.4	–15%	Similar	2.9	–24%	Below	4	21%	Similar
Biological Sciences									
SCHs	245	59%	Similar	260	–28%	Similar	40	–61%	Below
Course Sections	4.2	20%	Similar	3.6	–38%	Below	0.5	–63%	Below
Mathematics/Stats									
SCHs	223	–13%	Similar	284	–35%	Below	472	32%	Above
Course Sections	2.7	–9%	Below	3.5	–16%	Below	3.7	8%	Similar
Physical Sciences									
SCHs	243	51%	Similar	336	227%	Above	419	129%	Above
Course Sections	4.2	13%	Above	3.4	50%	Below	7.4	29%	Above
Chemistry									
SCHs	294	32%	Above	462	611%	Above	383	42%	Above
Course Sections	5.3	10%	Above	2	n.a.	Below	8.1	197%	Above
Physics									
SCHs	180	54%	Below	246	131%	Below	238	119%	Similar
Course Sections	3.4	–8%	Similar	3.3	233%	Below	7.7	147%	Above
Psychology									
SCHs	212	–7%	Below	372	193%	Similar	577	84%	Above
Course Sections	4.9	–8%	Above	2	–71%	Below	7.1	97%	Above
Social Sciences									
SCHs	323	12%	Above	257	–47%	Below	459	49%	Above
Course Sections	2.9	–4%	Below	2	–42%	Below	3.9	12%	Similar
Economics									
SCHs	329	1%	Above[b]	582	5%	Above[b]	442	168%	Above[b]
Course Sections	3.1	4%	Similar[b]	4	–8%	Above[b]	4	75%	Similar[b]
Arts									
SCHs	156	–22%	Similar	1089	196%	Above	221	–2%	Above
Course Sections	5.5	8%	Above	7.3	29%	Above	5.4	19%	Above
Health									
SCHs	238	–9%	Above	319	–27%	Above	195	–6%	Similar
Course Sections	3.8	–14%	Above	3.7	–1%	Above	4.6	8%	Similar
Business									
SCHs	223	–9%	Similar	373	–8%	Above	369	–21%	Above
Course Sections	3.1	6%	Similar	3.1	–9%	Below	4	–9%	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.

[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.

[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from JMU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-5: LU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2007	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2007	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2007	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	174	83%	Similar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	4.5	–4%	Above	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Education									
SCHs	165	–2%	Similar	208	18%	Above	197	–3%	Above
Course Sections	4.6	33%	Above	4.5	13%	Above	3.8	–12%	Above
Engineering									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
English									
SCHs	202	4%	Similar	222	–7%	Similar	226	–10%	Similar
Course Sections	4.7	9%	Above	4	–3%	Similar	4	3%	Similar
Biological Sciences									
SCHs	201	8%	Below	277	7%	Similar	n.a.	n.a.	n.a.
Course Sections	4.1	–9%	Similar	3	0%	Below	n.a.	n.a.	n.a.
Mathematics/Stats									
SCHs	278	7%	Above	343	3%	Similar	240	–29%	Below
Course Sections	4.3	–2%	Above	4	0%	Similar	4	0%	Similar
Physical Sciences									
SCHs	231	48%	Similar	153	–39%	Below	n.a.	n.a.	n.a.
Course Sections	4.7	12%	Above	3.5	–4%	Below	n.a.	n.a.	n.a.
Chemistry									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Physics									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Psychology									
SCHs	331	15%	Above	n.a.	n.a.	n.a.	165	–51%	Below
Course Sections	4.5	–1%	Above	n.a.	n.a.	n.a.	4.8	0%	Above
Social Sciences									
SCHs	367	–20%	Above	171	n.a.	Below	908	111%	Above
Course Sections	5.2	11%	Above	3.3	n.a.	Similar	17.2	281%	Above
Economics									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Arts									
SCHs	139	13%	Similar	150	–31%	Similar	248	12%	Above
Course Sections	5.2	–1%	Above	4.3	–24%	Above	7.2	20%	Above
Health									
SCHs	126	–31%	Below	278	43%	Above	306	0%	Above
Course Sections	3.1	–21%	Similar	7.8	17%	Above	7.9	27%	Above
Business									
SCHs	271	–4%	Above	209	–31%	Below	316	18%	Above
Course Sections	4.5	2%	Above	5.1	11%	Above	6.8	32%	Above

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable and "—" indicates data was not provided.
[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.
[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from LU, fall 2007 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-6: NSU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	132	27%	Below	553	201%	Above	n.a.	n.a.	n.a.
Course Sections	3.1	11%	Similar	3	–12%	Below	n.a.	n.a.	n.a.
Education									
SCHs	150	26%	Below	343	9%	Above	n.a.	n.a.	n.a.
Course Sections	3.2	–7%	Similar	5.4	9%	Above	n.a.	n.a.	n.a.
Engineering									
SCHs	75	195%	Below[b]	0	–100%	Below[b]	0	n.a.	Below[b]
Course Sections	3	41%	Similar[b]	2	–50%	Below[b]	16.7	n.a.	Above[b]
English									
SCHs	228	16%	Above	290	–19%	Above	286	–1%	Above
Course Sections	3.4	–25%	Similar	4.3	–43%	Above	4.1	–41%	Similar
Biological Sciences									
SCHs	208	–1%	Similar	526	–1%	Above	204	–7%	Below
Course Sections	3.8	–19%	Similar	8.3	4%	Above	5.2	–6%	Similar
Mathematics/Stats									
SCHs	246	35%	Similar	383	7%	Above	300	0%	Similar
Course Sections	3.1	–6%	Similar	4.6	–22%	Above	3.7	–38%	Similar
Physical Sciences									
SCHs	124	17%	Below	0	–100%	Below	n.a.	n.a.	n.a.
Course Sections	2.3	1%	Below	5	18%	Above	n.a.	n.a.	n.a.
Chemistry									
SCHs	144	25%	Below	123	71%	Below	n.a.	n.a.	n.a.
Course Sections	2.5	–2%	Below	5	0%	Above	n.a.	n.a.	n.a.
Physics									
SCHs	177	7%	Below	218	24%	Below	n.a.	n.a.	n.a.
Course Sections	2.9	14%	Below	5	15%	Similar	n.a.	n.a.	n.a.
Psychology									
SCHs	259	–8%	Similar	185	–46%	Below	272	647%	Below
Course Sections	2.6	–32%	Below	3.5	–19%	Similar	2.1	157%	Below
Social Sciences									
SCHs	240	–1%	Below	332	2%	Similar	n.a.	n.a.	n.a.
Course Sections	2.2	–39%	Below	10.5	–22%	Above	n.a.	n.a.	n.a.
Economics									
SCHs	275	n.a.	Similar[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	2	n.a.	Below[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Arts									
SCHs	181	–7%	Above	n.a.	n.a.	n.a.	252	–1%	Above
Course Sections	6.4	–25%	Above	n.a.	n.a.	n.a.	5.1	39%	Above
Health									
SCHs	142	53%	Below	286	36%	Above	273	225%	Above
Course Sections	2.3	–14%	Below	4.7	0%	Above	7.4	456%	Above
Business									
SCHs	295	11%	Above	415	–16%	Above	341	n.a.	Above
Course Sections	3.2	–19%	Similar	4.5	–38%	Above	5.3	n.a.	Above

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.

[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.

[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from NSU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-7: ODU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	99	–38%	Below	454	105%	Similar	426	–48%	Above
Course Sections	3.1	–27%	Above	5.2	18%	Above	4.7	107%	Above
Education									
SCHs	130	–31%	Similar	337	67%	Above	235	4%	Similar
Course Sections	2.8	–10%	Above	5.3	76%	Above	4.4	19%	Above
Engineering									
SCHs	137	–10%	Below	377	–11%	Above	353	–2%	Above
Course Sections	3.2	–9%	Above	5.5	–24%	Above	5.8	–4%	Above
English									
SCHs	116	–22%	Below	365	6%	Above	330	33%	Above
Course Sections	2.5	–7%	Above	4.8	3%	Above	4.9	56%	Above
Biological Sciences									
SCHs	186	37%	Similar	1308	53%	Above	384	384%	Above
Course Sections	2.9	28%	Above	17	10%	Above	3.1	2%	Below
Mathematics/Stats									
SCHs	192	–6%	Similar	507	–7%	Below	363	3%	Below
Course Sections	2.2	–19%	Above	4.3	17%	Above	2.7	–2%	Below
Physical Sciences									
SCHs	210	19%	Similar	1329	9%	Above	227	–66%	Below
Course Sections	2.8	35%	Above	10.2	–15%	Above	10.4	95%	Above
Chemistry									
SCHs	230	13%	Below	1265	0%	Above	n.a.	n.a.	n.a.
Course Sections	2.8	–2%	Similar	13.3	–1%	Above	n.a.	n.a.	n.a.
Physics									
SCHs	240	48%	Above	n.a.	n.a.	n.a.	0	–100%	Below
Course Sections	2.3	56%	Similar	n.a.	n.a.	n.a.	4.5	11%	Below
Psychology									
SCHs	204	–9%	Below	1076	26%	Above	954	110%	Above
Course Sections	3.1	–6%	Above	4.5	38%	Above	2.9	–21%	Below
Social Sciences									
SCHs	257	4%	Above	783	93%	Above	259	–3%	Below
Course Sections	2.5	–1%	Above	5.5	54%	Above	2.2	–20%	Below
Economics									
SCHs	180	–20%	Below	665	122%	Similar	360	3%	Below
Course Sections	1.9	–11%	Below	4	43%	Above	2.7	5%	Below
Arts									
SCHs	136	–19%	Similar	386	24%	Above	265	13%	Above
Course Sections	3.7	–4%	Above	7.8	12%	Above	5.1	4%	Above
Health									
SCHs	126	–15%	Below	204	14%	Similar	79	15%	Below
Course Sections	2.8	3%	Above	3.1	5%	Above	1.5	2%	Below
Business									
SCHs	148	–16%	Below	492	18%	Similar	308	–27%	Below
Course Sections	2.2	–7%	Similar	4.3	15%	Above	3	–24%	Below

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.

[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from ODU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-8: RU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	213	13%	Above	219	6%	Below	n.a.	n.a.	n.a.
Course Sections	3.1	–17%	Similar	4.8	10%	Above	n.a.	n.a.	n.a.
Education									
SCHs	204	6%	Above	265	102%	Above	237	–2%	Above
Course Sections	3.2	11%	Similar	5.4	90%	Above	5.6	26%	Above
Engineering									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
English									
SCHs	187	–16%	Similar	228	–12%	Similar	261	–10%	Similar
Course Sections	3.5	–3%	Similar	3.7	10%	Similar	4	0%	Similar
Biological Sciences									
SCHs	261	7%	Above	311	–36%	Above	288	0%	Above
Course Sections	5.5	6%	Above	6	–40%	Above	5.8	–1%	Above
Mathematics/Stats									
SCHs	249	–23%	Similar	505	–12%	Above	483	–8%	Above
Course Sections	4	–6%	Above	5.2	–1%	Above	4	0%	Similar
Physical Sciences									
SCHs	300	–4%	Above	345	n.a.	Above	282	–2%	Above
Course Sections	6.2	–16%	Above	7.3	n.a.	Above	26.9	347%	Above
Chemistry									
SCHs	304	2%	Above	374	n.a.	Above	n.a.	n.a.	n.a.
Course Sections	7.6	23%	Above	8	n.a.	Above	n.a.	n.a.	n.a.
Physics									
SCHs	272	–10%	Above	288	n.a.	Similar	281	–6%	Above
Course Sections	6	–10%	Above	6	n.a.	Above	6	100%	Above
Psychology									
SCHs	179	–23%	Below	n.a.	n.a.	n.a.	360	–35%	Above
Course Sections	3.2	4%	Similar	n.a.	n.a.	n.a.	5.8	16%	Above
Social Sciences									
SCHs	329	4%	Above	417	–2%	Above	410	–7%	Above
Course Sections	3	0%	Similar	4	0%	Above	4.3	4%	Above
Economics									
SCHs	323	16%	Similar[b]	458	7%	Above[b]	444	–8%	Above[b]
Course Sections	2.9	5%	Similar[b]	4	0%	Above[b]	4	0%	Similar[b]
Arts									
SCHs	193	10%	Above	172	–48%	Similar	352	49%	Above
Course Sections	4.3	–17%	Above	7.8	49%	Above	7	5%	Above
Health									
SCHs	146	19%	Below	146	1%	Similar	62	–77%	Below
Course Sections	2.5	–4%	Below	2.6	14%	Below	4.3	10%	Similar
Business									
SCHs	281	–7%	Above	338	n.a.	Similar	426	5%	Above
Course Sections	3.1	39%	Similar	4	n.a.	Similar	4	–6%	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.

[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.

[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from RU, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-9: UVA's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	159	–2%	Similar	653	64%	Above	329	–9%	Above
Course Sections	1.4	–19%	Below	6	167%	Above	4	0%	Similar
Education									
SCHs	147	–20%	Similar	134	–2%	Below	247	–7%	Above
Course Sections	2.2	4%	Similar	2.1	31%	Below	4	0%	Above
Engineering									
SCHs	193	29%	Above	313	68%	Similar	200	–63%	Similar
Course Sections	1.8	14%	Below	2.9	–1%	Below	4	0%	Similar
English									
SCHs	154	–11%	Above	105	–13%	Below	204	143%	Below
Course Sections	1.6	1%	Below	1.8	–31%	Below	4	0%	Similar
Biological Sciences									
SCHs	98	–33%	Below	402	45%	Below	320	5%	Above
Course Sections	0.7	–24%	Below	4.2	301%	Below	4	0%	Below
Mathematics/Stats									
SCHs	129	–1%	Below	618	126%	Similar	425	–11%	Similar
Course Sections	1.8	12%	Below	6.8	280%	Above	4	0%	Above
Physical Sciences									
SCHs	248	3%	Above	1256	–4%	Above	378	273%	Below
Course Sections	2.3	46%	Similar	7	86%	Above	4	0%	Below
Chemistry									
SCHs	316	14%	Above	1303	18%	Above	636	n.a.	Above
Course Sections	2	26%	Below	8	140%	Similar	4	n.a.	Below
Physics									
SCHs	219	16%	Similar	n.a.	n.a.	n.a.	365	352%	Below
Course Sections	3.2	63%	Above	n.a.	n.a.	n.a.	4	0%	Below
Psychology									
SCHs	357	–3%	Above	415	–7%	Below	136	–92%	Below
Course Sections	1.5	2%	Below	2.5	64%	Below	4	0%	Above
Social Sciences									
SCHs	250	–1%	Similar	304	53%	Below	668	19%	Above
Course Sections	1.5	–12%	Below	1.7	11%	Below	4	0%	Similar
Economics									
SCHs	292	–10%	Above	371	49%	Below	582	n.a.	Above
Course Sections	1.4	–9%	Below	1.9	68%	Below	4	n.a.	Above
Arts									
SCHs	146	–17%	Similar	102	–44%	Below	151	82%	Below
Course Sections	1.7	–14%	Below	4.6	88%	Above	4	0%	Similar
Health									
SCHs	84	0%	Below	164	–19%	Below	107	–10%	Below
Course Sections	1.6	16%	Below	2.7	122%	Similar	4	0%	Above
Business									
SCHs	182	–5%	Below	270	–8%	Below	257	29%	Below
Course Sections	1.5	12%	Below	1.6	5%	Below	4	0%	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.
[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from UVA, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-10: UVA-W's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	114	–39%	Below	n.a.	n.a.	n.a.	36	n.a.	Below
Course Sections	4	0%	Above	n.a.	n.a.	n.a.	3	n.a.	Below
Education									
SCHs	171	–3%	Similar	113	–32%	Below	157	–23%	Similar
Course Sections	3.3	–2%	Similar	4.4	–22%	Above	6.6	–12%	Above
Engineering									
SCHs	116	n.a.	Below[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	3.8	n.a.	Above[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
English									
SCHs	213	–9%	Above	222	2%	Similar	250	25%	Similar
Course Sections	4.3	1%	Above	4.7	23%	Above	4	0%	Similar
Biological Sciences									
SCHs	215	27%	Similar	227	22%	Below	239	25%	Similar
Course Sections	5	25%	Above	3.6	–11%	Below	3	–63%	Below
Mathematics/Stats									
SCHs	222	–27%	Similar	312	–12%	Similar	225	n.a.	Below
Course Sections	4	14%	Above	4.4	4%	Above	4	n.a.	Similar
Physical Sciences									
SCHs	196	–15%	Below	280	n.a.	Similar	170	–61%	Below
Course Sections	4.7	31%	Above	5	–29%	Above	3	2%	Below
Chemistry									
SCHs	224	13%	Similar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	5	67%	Above	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Physics									
SCHs	142	–47%	Below	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	4	–20%	Similar	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Psychology									
SCHs	368	51%	Above	132	–67%	Below	300	47%	Similar
Course Sections	5.5	31%	Above	4	0%	Above	4	0%	Similar
Social Sciences									
SCHs	296	–3%	Similar	n.a.	n.a.	n.a.	291	–11%	Below
Course Sections	4.1	18%	Above	n.a.	n.a.	n.a.	4.1	–4%	Similar
Economics									
SCHs	331	3%	Above[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	4.7	27%	Above[b]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Arts									
SCHs	141	78%	Similar	105	–9%	Below	142	46%	Below
Course Sections	4.8	6%	Above	4.3	–11%	Above	5.8	3%	Above
Health									
SCHs	118	72%	Below	56	–12%	Below	168	133%	Below
Course Sections	3.5	17%	Similar	2	–43%	Below	4	–25%	Similar
Business									
SCHs	191	–29%	Below	247	–37%	Below	152	–42%	Below
Course Sections	3.8	–12%	Above	4	–20%	Similar	4.2	6%	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.

[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.

[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from UVA-W, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-11: VCU's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Education									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Engineering									
SCHs	138	--	Below	277	--	Similar	1068	--	Above
Course Sections	--	--	--	--	--	--	--	--	--
English									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Biological Sciences									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Mathematics/Stats									
SCHs	167	--	Similar	461	--	Below	425	--	Similar
Course Sections	2.2	--	Similar	4	--	Above	4.2	--	Above
Physical Sciences									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Chemistry									
SCHs	221	--	Below	993	--	Above	912	--	Above
Course Sections	1.4	--	Below	5.7	--	Below	3	--	Below
Physics									
SCHs	632	--	Above	920	--	Above	124	--	Below
Course Sections	2.8	--	Above	4.8	--	Similar	2.3	--	Below
Psychology									
SCHs	381	--	Above	1094	--	Above	725	--	Above
Course Sections	1.7	--	Below	4.2	--	Above	4.8	--	Above
Social Sciences									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Economics									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Arts									
SCHs	124	--	Below	119	--	Below	344	--	Above
Course Sections	--	--	--	--	--	--	--	--	--
Health									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Business									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "—" indicates data was not provided.
[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from VCU, fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-12: VMI's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	73	–16%	Below	n.a.	n.a.	n.a.	30	n.a.	Below
Course Sections	3	15%	Similar	n.a.	n.a.	n.a.	1.3	n.a.	Below
Education									
SCHs	--	--	--	--	--	--	--	--	--
Course Sections	--	--	--	--	--	--	--	--	--
Engineering									
SCHs	98	–4%	Below[b]	n.a.	n.a.	n.a.	194	62%	Above[b]
Course Sections	3.5	–12%	Above[b]	n.a.	n.a.	n.a.	6	56%	Above[b]
English									
SCHs	141	29%	Below	n.a.	n.a.	n.a.	176	25%	Below
Course Sections	3.8	23%	Above	n.a.	n.a.	n.a.	6.7	49%	Above
Biological Sciences									
SCHs	134	8%	Below	n.a.	n.a.	n.a.	334	n.a.	Above
Course Sections	2.6	–19%	Below	n.a.	n.a.	n.a.	3.6	n.a.	Below
Mathematics/Stats									
SCHs	174	–8%	Below	n.a.	n.a.	n.a.	269	–6%	Below
Course Sections	3.2	–1%	Similar	n.a.	n.a.	n.a.	4.6	–7%	Above
Physical Sciences									
SCHs	103	5%	Below	n.a.	n.a.	n.a.	275	–7%	Above
Course Sections	2.9	–18%	Below	n.a.	n.a.	n.a.	10	45%	Above
Chemistry									
SCHs	116	–13%	Below	n.a.	n.a.	n.a.	271	–22%	Above
Course Sections	3.3	–29%	Below	n.a.	n.a.	n.a.	10	8%	Above
Physics									
SCHs	108	416%	Below	n.a.	n.a.	n.a.	283	15%	Above
Course Sections	3.2	7%	Below	n.a.	n.a.	n.a.	10	67%	Above
Psychology									
SCHs	175	–3%	Below	203	7%	Below	248	11%	Below
Course Sections	4.3	42%	Above	4	0%	Above	5	0%	Above
Social Sciences									
SCHs	166	–8%	Below	n.a.	n.a.	n.a.	251	19%	Below
Course Sections	3	–11%	Below	n.a.	n.a.	n.a.	4.6	–15%	Above
Economics									
SCHs	156	7%	Below[b]	n.a.	n.a.	n.a.	239	–48%	Below[b]
Course Sections	2.9	7%	Similar[b]	n.a.	n.a.	n.a.	4.6	–54%	Above[b]
Arts									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	270	170%	Above
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5	–50%	Above
Health									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Business									
SCHs	173	33%	Below	n.a.	n.a.	n.a.	255	n.a.	Below
Course Sections	2.8	0%	Below	n.a.	n.a.	n.a.	4.3	n.a.	Similar

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable and "—" indicates data was not provided.
[a] Compared to weighted national average for master's and baccalaureate institutions. "Similar" is within 10 percent above or below.
[b] Compared to the national average for master's institutions because data on baccalaureate institutions was unavailable.

Source: JLARC staff analysis of data from VMI, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Table I-13: VT's Average Teaching Loads per Faculty FTE, Fall 2010

Discipline	Tenured and Tenure-Track			Non-Tenure-Track			Supplemental		
	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]	Fall 2010	% Change Since 2004	Compared to Carnegie Average[a]
Computer Sciences									
SCHs	149	–29%	Similar	311	8%	Below	549	40%	Above
Course Sections	1.7	–10%	Below	2.4	–4%	Below	5.1	42%	Above
Education									
SCHs	119	–29%	Below	n.a.	n.a.	n.a.	288	67%	Above
Course Sections	2.2	10%	Similar	n.a.	n.a.	n.a.	3.1	–26%	Below
Engineering									
SCHs	233	21%	Above	124	82%	Below	196	13%	Similar
Course Sections	2.5	18%	Similar	3.1	57%	Below	2.7	–8%	Below
English									
SCHs	124	7%	Similar	254	–1%	Similar	243	–15%	Similar
Course Sections	1.6	2%	Below	2.8	9%	Below	4.1	3%	Above
Biological Sciences									
SCHs	236	–18%	Above	803	–41%	Above	612	–43%	Above
Course Sections	1.7	–18%	Below	2.1	3%	Below	5.8	17%	Above
Mathematics/Stats									
SCHs	180	–16%	Similar	869	5%	Above	704	–32%	Above
Course Sections	1.9	–17%	Similar	5.2	24%	Above	4.3	–11%	Above
Physical Sciences									
SCHs	296	–8%	Above	1049	41%	Above	1000	19%	Above
Course Sections	2.8	0%	Above	18.5	8%	Above	7.4	4%	Above
Chemistry									
SCHs	300	–18%	Above	1026	7%	Above	1450	83%	Above
Course Sections	2	17%	Below	21	–12%	Above	9.5	1%	Above
Physics									
SCHs	354	22%	Above	1674	n.a.	Above	732	3%	Above
Course Sections	3.6	–29%	Above	13	n.a.	Above	6.9	68%	Above
Psychology									
SCHs	287	0%	Above	265	1934%	Below	479	–5%	Above
Course Sections	1.4	1%	Below	2	n.a.	Below	4.5	19%	Above
Social Sciences									
SCHs	250	–17%	Similar	2768	116%	Above	362	–40%	Below
Course Sections	2.4	1%	Similar	4.1	–60%	Above	4	5%	Similar
Economics									
SCHs	201	31%	Similar	2091	3%	Above	431	–55%	Similar
Course Sections	1.9	–16%	Similar	2	0%	Below	4.2	33%	Above
Arts									
SCHs	303	42%	Above	142	18%	Below	200	–43%	Similar
Course Sections	1.8	6%	Below	2.3	69%	Below	3.3	–5%	Below
Health									
SCHs	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Course Sections	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Business									
SCHs	274	17%	Above	1027	–15%	Above	602	–10%	Above
Course Sections	2.2	9%	Similar	5	–32%	Above	4.3	9%	Above

Notes: (i) Although efforts were taken to ensure that Virginia institutions adhered to the Delaware Study methodology used for the national averages, JLARC staff were unable to independently validate or verify the data provided by some Virginia institutions which may result in some distortions relative to the national averages. The Virginia data is therefore not directly comparable to the Delaware Study averages, and should not be interpreted as such. (ii) "n.a." is not applicable.
[a] Compared to the national averages for research institutions. "Similar" is within 10 percent above or below.

Source: JLARC staff analysis of data from VT, fall 2004 and fall 2010; JLARC staff analysis of data from the University of Delaware National Study of Instructional Costs and Productivity, fall 2010.

Appendix J

Agency Responses

As part of an extensive validation process, State agencies and other entities involved in a JLARC assessment are given the opportunity to comment on an exposure draft of the report. JLARC staff provided an exposure draft of this report to the Secretary of Education and the following State agencies and institutions:

- State Council of Higher Education for Virginia
- Christopher Newport University
- College of William and Mary
- George Mason University
- James Madison University
- Longwood University
- Norfolk State University
- Old Dominion University
- Radford University
- University of Mary Washington
- University of Virginia
- University of Virginia – Wise
- Virginia Commonwealth University
- Virginia Military Institute
- Virginia State University
- Virginia Tech

Appropriate corrections resulting from technical and substantive comments have been made in this version of the report.

This appendix includes written response letters provided by:

- Secretary of Education
- State Council of Higher Education for Virginia
- George Mason University
- Norfolk State University
- University of Virginia
- Virginia Tech

COMMONWEALTH of VIRGINIA
Office of the Governor

Javaid E. Siddiqi
Secretary of Education

December 2, 2013

Mr. Hal Greer
Director
Joint Legislative Audit and Review Commission
201 North 9th Street
General Assembly Building, Suite 1100
Richmond, VA 23219

Dear Director Greer,

Thank you for the opportunity to review and comment on the draft report *Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions*. I commend you and your team for the tremendous research and analysis conducted in preparation of this report. With one exception, I support the recommendations as presented and believe they will provide both greater transparency and efficiency as it concerns academic spending in higher education.

I have provided a few suggestions recommending additional thoughts, background, and/or clarification in some areas of the report:

As it relates to Recommendation 1, I support the existing exclusion of endowment funds in salary comparisons. As the *Code of Virginia* §23-9.2 details, endowment funds are currently set apart from other revenues of and appropriations to our higher education institutions. Prospective donors to endowment funds might hesitate to contribute if there is fear of the Commonwealth withdrawing funding support as a result of private giving. It is important to recognize the importance of these endowments to our institutions and by including endowment funds in salary calculations/comparisons, I fear we compromise private giving. At a minimum, I recommend addressing this concern and referencing the above code section so that the Commission is aware of the recommendation's possible implications.

It may also be helpful to incorporate the economic benefits documented by a recent Weldon Cooper study stating, "Research expenditures by higher education are responsible for nearly 9,655 jobs, $472 million in GDP, and $43 million in state revenues. An estimated 73 percent of higher education research funds are derived from out-of-state sources, primarily the federal government."

Further, the value of the maintenance reserve program should not be overlooked. I recommend adding background on this as a vital component of the state's capital outlay program. Sound good business practice, as encouraged by the state, is to build reserves so that future renovation and other expenses can be provided for when needed.

In closing, I appreciate the work you and your team have done in response to House Joint Resolution 108. Governor McDonnell has made higher education a top priority throughout his Administration. He has worked with the legislature to help begin to restore the budget cuts of the

recession. At the same time, Governor McDonnell asked institutions to increase their budget reallocations to priorities of the Commonwealth's higher education roadmap outlined in the Higher Education Opportunity Act of 2011 while keeping their tuition increases as low as possible. As a result, our public institutions are becoming more transparent and efficient.

Please let me know how I can be of assistance to you or your team as you complete your work.

Sincerely,

Javaid E. Siddiqi

Peter Blake
Director

COMMONWEALTH of VIRGINIA

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
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December 2, 2013

Mr. Hal Greer
Director
Joint Legislative Audit and Review Commission
Suite 1100, General Assembly Building
Richmond, VA 23219

Dear Hal,

Thank you for the opportunity to review the exposure draft of JLARC's third report in fulfillment of HJR 108 (2012), entitled "Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions." I commend you and your staff for excellent work in a complicated environment.

I am pleased to see that JLARC supports the use of institutional peer groups as a means to allocate funds for competitive faculty salaries. We support your recommendations to rebase the appropriated salary and to consider other factors in developing peer groups.

We do not support, however, JLARC's recommendation to include external funding sources in faculty salary comparisons. Private donations to support faculty endowments are made expressly to provide a "margin of excellence," not as a substitute for public funding. Including them in the salary calculation would compromise private giving and is contrary to long-standing public policy.

Chapter 6 shows a depth of understanding about the research mission of many of Virginia's universities. To make this chapter even stronger, you might consider referring to a recent study from the Weldon Cooper Center for Public Service (*Study of the Economic Impact of Virginia Higher Education: 2013 Update*). It observes that higher education research expenditures in Virginia lead to almost 9,700 jobs, $472 million in GDP and $43 million in state revenues.

Finally, the report recommends a number of actions that SCHEV, in cooperation with others, should take in the areas of research funding, distance learning and online education, and space planning guidelines. We agree that these should be high priorities for the Commonwealth and look forward to working with you and others on these various initiatives.

Thanks again for your thoughtful analysis of academic spending and workload in Virginia higher education institutions. We look forward to working with you on the remaining reports of HJR 108.

Sincerely,

Peter Blake

GEORGE MASON UNIVERSITY

Ángel Cabrera
President

4400 University Drive, MS 3A1, Fairfax, Virginia 22030
Phone: 703-993-8700; Fax: 703-993-8880; E-mail: president@gmu.edu

November 22, 2013

Mr. Hal E. Greer
Director
Joint Legislative Audit and Review Commission
Suite 1100
General Assembly Building, Capitol Square
Richmond, Virginia 23129

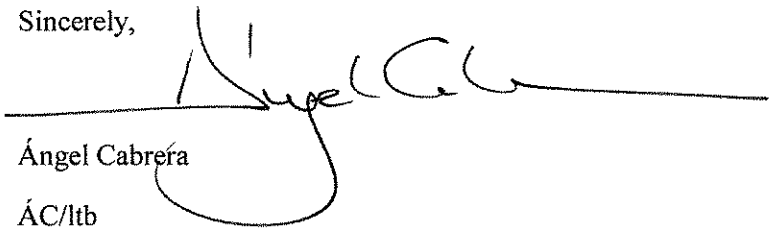
Dear Mr. Greer:

Thank you for providing us with the opportunity to review and comment upon JLARC's most recent higher education report, *Review of Academic Expenditures and Workload at Virginia's Public Higher Education Institutions*. The care and rigor with which the Commission undertook this study is evident throughout. We believe the report provides a poignant and thoughtful assessment of both national and Commonwealth trends in academic expenditures, faculty workload, research expenditures and capital expansion. We appreciate the Commission's recognition that despite substantial increases in the cost of instruction and academic research over time, the higher education institutions of the Commonwealth collectively are below national averages on a per capita basis.

We support the six JLARC recommendations in this report, and in particular strongly support your recommendation that consideration be given to rebasing appropriated salary levels to align with actual institutional experience. The use of artificially low appropriated salaries in the calculation of Base Budget Adequacy results, for George Mason University, in the significant understatement of institutional financial need and at the same time suggests -- as your report makes clear -- that our faculty salaries are even further below the Commonwealth policy objective than is actually the case. We welcome the correction of both issues.

Again, George Mason University appreciates the opportunity to participate in this process. The report was very insightful and provides clarity to numerous complex issues impacting higher education. We look forward to continuing to work with you and your staff on the next stages of this project.

Sincerely,



Ángel Cabrera

ÁC/ltb

November 21, 2013

Hal E. Greer
Director
Joint Legislative Audit and Review Commission
201 North 9th Street
General Assembly Building, Suite 1100
Richmond, Virginia 23219

Dear Mr. Greer:

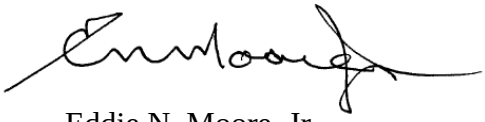
Thank you providing an opportunity for Norfolk State University to respond to the exposure draft of the Joint Legislative Audit and Review Committee (JLARC) Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions. We support the recommendations presented in the report. The comments included in this letter are meant to highlight Norfolk State University's (NSU) performance and results related to some of the Commonwealth's Higher Education statewide initiatives that are addressed in the report. We have submitted amended faculty salary average data for Norfolk State University to JLARC staff in a separate communication. The performance highlights that we would like to mention are as follows:

1. NSU maintains one of the lowest average faculty salaries and the lowest instructional spending rate per full-time equivalent student in the Commonwealth, yet NSU shows an increase in the tenured and tenure track faculty workloads during the Fall 2004 through 2010 time period.
2. NSU's success in deploying instructional technology is noteworthy. The report shows that a total of 15% of the credit hours taught at NSU are taught electronically, comprising 10% of the state's total online instruction. This equals Virginia Tech's proportion of the state total.
3. NSU continues to focus on increasing its STEM-H instruction. STEM-H courses made up 32.3% of the total instruction provided in 2012. This is the fourth highest among the public institutions behind Virginia Tech, VMI, and ODU.
4. NSU is one of three institutions that have less instructional space available in 2012 than in 2005. NSU has been able to reduce O&M costs per student by 20% over the time period covered by the study.

We believe that Norfolk State University's commitment to the Commonwealth's initiatives and these accomplishments are worthy of note. Norfolk State University continues to face challenges, some of which are resource related. The administration is dedicated to maximizing the use of resources available to best serve the University's mission.

Feel free to contact me or Ms. Clementine Cone, Executive Assistant to the President for University Compliance, if you have any questions.

Sincerely,



Eddie N. Moore, Jr.,
Interim President and CEO

UNIVERSITY of VIRGINIA
OFFICE OF THE PRESIDENT

November 22, 2013

Mr. Hal E. Greer
Director, Joint Legislative Audit and Review Commission (JLARC)
201 North 9th Street
General Assembly Building, Suite 1100
Richmond, Virginia 23219

Dear Mr. Greer:

Thank you for providing the University of Virginia (U.Va.) with the opportunity to review and comment on the draft report *Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions*. The JLARC staff is to be commended for the compilation and synthesis of significant amounts of data in a relatively short period of time. The staff is also to be commended for a nuanced review of academic spending and workload that differentiates between institutional type and mission. Per your letter of November 8, 2013, the University has submitted technical comments on the report through the JLARC comment Web site. This letter addresses substantive issues related to the contents of the draft report.

The University would like to provide additional context about academic spending, particularly as it relates to academic quality. As you are aware, House Joint Resolution 108 (2012) directed JLARC to "study the cost efficiency of Virginia's institutions of higher education." Efficient use of the revenues that support the University – including general funds, non-general funds, extramural grants, and private funds – is a paramount concern. U.Va., particularly since state restructuring and decentralization in the early 1990s, has been a public sector leader in achieving efficiencies, streamlining operations, and minimizing institutional costs while preserving the core academic mission. As important to the efficient use of resources is the *effective* use of resources.

Instructional Spending: As noted in the draft report, instructional spending per FTE student at U.Va. is 32 percent above the national average for public research institutions (p. 7).[1] Adequate financial resources are key contributors to academic quality in that they support faculty compensation, instructional space, smaller class sizes, and other mission-related instructional activities. Indeed, this level of instructional spending is one reason that U.Va. is consistently ranked among the leading national universities. For example, in 2014, *U.S. News and World Report* (USNWR) ranked the University 23rd among public and private universities and 2nd among public institutions. More telling, however, is a comparison of the USNWR financial resources ranking in

[1] A similar calculation benchmarked against public research institutions in the Association of American Universities (AAU) indicates instructional spending per FTE student at U.Va. is one percent below the average.

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relation to institutional ranking. Though ranked 23rd among national universities, U.Va. ranked 55th with respect to financial resources. No other institution among the top 23 had a financial resources ranking below 37th. U.Va. has achieved national competitiveness, with fewer financial resources than its public and private peers, through the efficient and effective use of the public and private support entrusted to it.

Space Utilization: Also noted in the draft report, using 2010 data, is instructional space utilization (pp. 102-103). U.Va. had a classroom utilization rate of 71 percent (23 hours) and a classroom lab utilization rate of 87 percent (19 hours). Through a multi-year process improvement initiative, U.Va. has enhanced space planning and management resulting in sustained space utilization improvements benchmarked against 2008 rates. According to 2012 data, provided by the State Council of Higher Education for Virginia (SCHEV), U.Va. increased its classroom utilization rate to 74 percent (25 hours) and its classroom lab utilization rate to 94 percent (21 hours).

While a utilization rate of 94 percent appears efficient, it is not necessarily the most effective use of physical resources. Best practice indicates the most effective utilization rate is 80 percent. This permits 20 percent of classroom labs to be taken offline for significant maintenance and/or renovation. U.Va. is actively addressing this issue – particularly given planned enrollment growth in STEM-H disciplines – by increasing the number of classroom labs and renovating existing classroom labs to modernize the facilities and accommodate planned changes in pedagogy. Timely financial support from the Commonwealth will be critical to keeping classroom lab capacity and quality ahead of increasing enrollments associated with state public policy goals.

Contingent Faculty and Teaching Loads: The draft report also addresses the use of contingent faculty and graduate teaching assistants (p. 19), as well as faculty teaching loads (Chapter 3). Between fiscal years 2005 and 2012, U.Va. decreased the proportion of contingent faculty and graduate teaching assistants (GTAs) by approximately six percent. The University places a high priority on the recruitment and retention of tenured/tenure-track faculty, with nationally competitive teaching loads, as the most efficient and effective use of financial resources.

Though the report suggests that "increased use of contingent faculty reduces costs," overreliance on such faculty is at cross-purposes with the University's mission to provide excellence in research and undergraduate instruction. First, tenured/tenure-track faculty have a greater impact on the University's research footprint than contingent faculty, including the receipt of more than $280 million in sponsored research funding (FY13). Second, as a collegiate research university, students and parents expect extensive interaction with full-time faculty dedicated to the residential nature of the institution. Such expectations are one reason why the University intentionally sought to reduce average class size, resulting in a nine percent decrease in the average number of student credit hours taught by tenured/tenure-track faculty between 2004 and 2010 (p. 42). Significant utilization of contingent faculty, as well as significant increases in the teaching loads of tenured/tenure-track faculty, would fundamentally transform the character of U.Va., preventing the institution from effectively fulfilling its instructional, research, and service missions.

Academic Research: The draft report also addresses sources of research funding (p. 77). It notes, "state support for academic research in Virginia has lacked continuity in both strategy and funding" (p. 88) and that "per capita [research] spending is considerably below [the] national average" (p. 7). In fiscal year 2011, U.Va. received less than one percent of research expenditures from state/local governments and nine percent from institutional resources. Eighty percent of research expenditures were derived from the federal government.

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Using data from the National Science Foundation (NSF), the University's federal research expenditures are approximately eight times the combined state/local government and institutional expenditures – compared to a national average of approximately three times among public institutions. U.Va. ranks first among its institutionally-designated peer group on this research performance metric. Even without significant state support for academic research, U.Va. has efficiently and effectively used such limited support to achieve significant returns on investment. Academic research at Virginia public institutions of higher education is an important driver of economic growth – responsible for 9,655 jobs, $472 million in GDP, and $43 million in state revenues[2] – and provides educational opportunities to undergraduate and graduate students.

Recommendations: With respect to the six recommendations contained in the draft report (p. 107), the University believes Recommendation #1 contradicts longstanding public policy. Appropriated average salaries represent the Commonwealth's baseline salary commitment to public institutions of higher education. Private salary sources, such as philanthropic support for endowed professorships, are intended to promote academic excellence and market competitiveness. As indicated in §23-9.2 of the *Code of Virginia*:

> [I]n measuring the extent to which the Commonwealth shall finance higher education in Virginia, the availability of the endowment funds and unrestricted gifts from private sources of institutions of higher education received by such institutions shall not be taken into consideration in, nor used to reduce, state appropriations or payments, but such funds shall be used in accordance with the wishes of the donors thereof to strengthen the services rendered by these institutions to the people of the Commonwealth.

The inclusion of private sources in appropriated average salaries would have a detrimental impact on the competitiveness of faculty salaries, as well as future efforts to secure philanthropic support for faculty compensation. The Commonwealth should not rely on private revenue sources to fund the state's policy goal for faculty compensation, a goal that – as the draft report notes – has been met "only three times during the past 24 years" (p. iii).

Thank you, again, for the opportunity to review and comment on the draft report. As the public policy conversation continues surrounding the efficiency of public higher education in the Commonwealth, I hope that the conversation is expanded to include the role of academic quality and the effectiveness of public institutions of higher education in fulfilling their diverse missions.

Sincerely,

Teresa A. Sullivan

Teresa A. Sullivan
President

[2] See *Study of the Economic Impact of Virginia Public Higher Education: 2013 Update* (Weldon Cooper Center for Public Service).

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VirginiaTech

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November 22, 2013

Hal E. Greer
Director
Joint Legislative Audit and Review Commission
201 North 9th Street
General Assembly Building, Suite 1100
Richmond, VA 23219

Dear Mr. Greer:

Virginia Tech appreciates the opportunity to respond to the exposure draft of the JLARC *Review of Academic Spending and Workload at Virginia's Public Higher Education Institutions* report. The report provides a comprehensive review of the current academic environment at Virginia's higher education institutions. The findings support the extraordinary success of our Commonwealth's higher education institutions, and recognize the hard work of our teaching and research faculty on behalf of our students and the Commonwealth of Virginia. We commend the significant efforts of JLARC in conducting a thorough assessment of the complex issues facing higher education. Virginia Tech has enjoyed a very positive working relationship with JLARC as this study progresses, and we hope that the following comments provide an additional perspective on the university's experience in a few key areas.

We appreciate JLARC's attention to the important issue of faculty compensation by recognizing the critical nature of competitive faculty compensation in your first recommendation. The Commonwealth's goal of achieving the 60th percentile of the peer group salary average is a long-standing and important goal of the system. We believe that this goal should be continued unchanged, in its present form, as the state's long-standing and official faculty salary benchmark. The recommendation to include external funding sources in the appropriated salary average is not congruent with the state's traditional responsibility for funding the Educational & General program. Further, the inclusion of external funding is in conflict with § 23-9.2 of the Code of Virginia, which states that "private funds, endowment funds, and unrestricted gifts from private sources of institutions of higher education received by such institutions shall not be taken into consideration in, nor used to reduce, state appropriations or payments…" This

recommendation to include external funding in appropriated salary average erodes the university's ability to reward excellence. Additionally, any change in the policy on private funds has the potential to significantly undermine future philanthropy efforts.

The cornerstone of higher education at large research institutions is the active engagement of the faculty and students in their research programs. The report provides a comprehensive assessment of the research environment at the higher education institutions in Virginia. However, we would like to provide the following comments as additional context to the information presented in the report:

- Virginia Tech's strategic plan includes the strategy to accelerate growth in targeted research areas to leverage faculty expertise that benefits both students and the Commonwealth. This strategy is in alignment with the state's goals of promoting STEM-H programs as enumerated in the Higher Education Opportunity Act of 2011.
- Research endeavors often require institutional investments to enhance our ability to maximize the acquisition of external funding, which brings new resources and opportunities to the institution and our state. Virginia Tech's practice of establishing targeted research institutes emulates the strategies of other large research universities throughout the country. This strategy is one of the primary reasons Virginia Tech has been able to double its research programs in recent years to over $450 million. We believe that our research programs are critical for a competitive state economy in the global environment.
- We also understand that research is a complex endeavor and that each institution is unique, making direct comparisons between institutions complicated due to different structures and approaches to research strategies. For example, Virginia Tech operates the Virginia Agricultural Experiment Station and therefore receives significant levels of state and US Department of Agriculture support for research. In addition, the university has a significant system of research institutes focused in areas such as bioinformatics, transportation, and biomedical and health sciences, a complex system of campus research infrastructure, and a wide array of funding from external sponsoring agencies.
- It is also important to note that Virginia Tech's significant increase in research program expenditures was accomplished while managing our overall cost of education (tuition and required fees) to achieve a more moderate cost increase during the last decade. As a result, in fiscal year 2013, Virginia Tech's tuition and fee rates remain very competitive in comparison to its SCHEV peer group.

Again, thank you for the opportunity to review and comment. We appreciate the professionalism of your staff in undertaking this review. We look forward to continuing to work together to preserve and enhance the policy environment that has allowed Virginia to build a world-class system of higher education.

Sincerely,

M. Dwight Shelton, Jr.
Vice President for Finance and
Chief Financial Officer

cc: Charles W. Steger
Mark G. McNamee

Staff of the Joint Legislative Audit and Review Commission

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