Report of the Graduate Education Task Force

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October 6, 2020

Members:

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Task force charged (by Provost Cyril Clarke, and VP & Dean Graduate Education Karen DePauw, in late spring 2019)

- Full charge memo included in the report; in summary, evaluate grad ed at VT and recommend ways to track and improve

- Here is what we considered the most key sentence:

  "review our research-based graduate education programs and draft recommendations for further enhancement"

We sought to answer two big questions

- How to help raise the stature of Virginia Tech by raising the profile, impact, magnitude, and stature of VT graduate research and education?

- How can we raise the quality of graduate education at Virginia Tech and improve the experience of VT graduate students?

Grad Research/Teaching Strongly Influences University Rankings

Element	Component	%
Teaching (30%) (learning environment)	Reputation survey	15
	Staff-to-student ratio	4.5
	Doctorate-to-bachelors ratio	2.25
	Doctorates awarded/academic staff ratio	6
	Institutional income	2.25
Research (30%) (volume, income, reputation)	Reputational survey	18
	Research income	6
	Research productivity	6
Citations (30%) (research influence)		30
International Outlook (7.5%) (staff, students, research)	Proportion of international students	2.5
	Proportion of international staff	2.5
	International collaboration	2.5
Industry Income (2.5%) (knowledge transfer)		2.5

Components of Times Higher Education Survey Analysis of University Rankings*

*https://www.timeshighereducation.com/world-university-rankings/world-university-rankings-2020-methodology

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Data on endowments & other aspects vs. "aspirational peers"

	University	2020 Ranking*	Endowment (M $)#	State Pop. (M)**	State GDP (B $)##	Per Capita State GDP	Full Time UG	Total GS	Full Time GS
1	U. Cal. - Berkeley	13	**4,271**	39.6	2998	75707	29351	11317	9601
2	Cornell U. (NY)	19	**5,298**	19.5	1669	85590	14898	8109	8025
3	U. Illinois	48	**1,659**	12.7	865	68110	32613	14261	10237
4	U. Wisconsin	51	**3,102**	5.8	336	57931	28977	11619	9591
5	U. Cal. - Davis	55	**1,108**	39.6	2998	75707	29284	7314	6763
6	Ohio St. U.	70	**4,253**	11.7	676	57778	42003	13891	10054
7	Penn. St. U.	78	**2,119**	12.8	783	61172	39785	6284	5551
8	U. Minnesota	79	**3,494**	5.6	369	65893	29991	16415	9714
9	Michigan St. U.	84	**3,075**	10.0	527	52700	35404	11203	8103
10	Purdue U. (IN)	88	**2,424**	6.7	367	54776	30277	10567	6442
11	U. Maryland	91	**519**	6.0	412	68667	27708	10653	8107
12	U. Arizona	104	**843**	7.2	348	48333	29325	9650	7124
13	Rutgers U.	168	**985**	8.9	622	69888	33677	13936	8517

*THE World University Rankings, 2020; #Center for Measuring University Performance, 2017 Data.
**US Census 2018 estimates; ##Federal Reserve Economic Data (FRED), 2018. Enrollment Data from IPEDS Fall 2017

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We tackled this complex task by constructing, testing hypotheses

Methodology:

Multiple external surveys, interviews, grad student forums, deep investigations of hypotheses, data gathering

Example Hypotheses:

- Our endowment is too small
  - Data: THE endowment data
  - Conclusion: **hypothesis confirmed**

- VT supports fewer graduate students per research dollar (i.e., we are inefficient)
  - Data: THE data
  - Conclusion: **hypothesis refuted**

Rough illustration of potential impact of higher endowment

- VT is 14th among the 17 (aspirational peers + VT + NCSU) in endowment (2017 data)
- Michigan St., Purdue, Penn St., Wisconsin, Minnesota among those with endowments more than $1B higher than VT's

Difference in endowment vs. VT:	**$1,000,000,000**
Annual interest generated*:	**$50,000,000**
Percentage allocated to graduate education:	**10%**
Amount allocated to graduate education:	**$5,000,000**
Assumed cost of a graduate fellowship:	**$50,000**
Increased number of grad fellowships available:	**100**

*Assumes 5% interest

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Key hypotheses tested:

Hypothesis	Data Developed	Conclusion
Larger UG population helps	UG, grad enrollment data	**Weakly supports**
Stipend size matters	IPEDS, NSF, survey data	**Supports**
VT has lost paying students over last decade	Grad enrollment data	**Supports** (MS)
VT has lost students on assistantships	Grad enrollment data	**Refutes**
VT supports fewer GS per research dollar due to inefficiencies	THE data	**Refutes**
Lags in fellowships, self-supported students, traineeships	NSF data	**Supports**
Decline in education masters dominates declines in grad students over last decade	Grad enrollment data	**Supports**
Recruitment strategies ineffectual	Application data	**Supports**
Endowment too small	THE data	**Supports**
Success rate for grants too low	Land grant univ. data	**Supports**
Insufficient support for GS-initiated proposals	NSF data	**Supports**

Enhancing quality of graduate education at VT

Strengths to be preserved & enhanced include:

- Commitment to diversity
- Sense of community
- Interdisciplinary focus
- Professional development
- Transformative graduate education

Improvement recommendations from grad student panel discussions:

- Need to enhance mentorship of grad students by faculty supervisors
- Need for improved professional development
- Grad student housing in Blacksburg in particular is too often subpar and expensive; interest in VT exerting influence on landlords in partnership with the town

"I suggest that VT set goals that are aspirational; not settling for being equivalent to peer land grants, but competing with the most excellent land grant universities"; VT grad student

Some important observations from the data:

- VT has full-time graduate student enrollment only 55% of average of aspirational peers
- VT external funding is 47% lower than the average of our aspirational peers ($297M vs. $564M)
- That may be overly optimistic; VT external funding has included major contributions from VTTI, Fralin BMI (whose focus is not entirely on graduate research), and the Biocomplexity Institute
- Graduate enrollment, applications, and yield have all been trending downwards (see table); not true of most of our aspirational peers
- Land grant universities from states with comparable resources (GDP, per capita GDP, population) have much higher rankings (e.g. Penn St. (78), Michigan St. (84), Purdue (88))

Fall term	Applications	Offer rate	Enrolled	Yield
2010	10327	39%	2265	57%
2013	10653	36%	2122	56%
2015	10135	41%	2306	56%
2017	9411	41%	2050	53%
2018	8051	45%	1891	52%
2019	7860	50%	2006	51%

(Full table in report)

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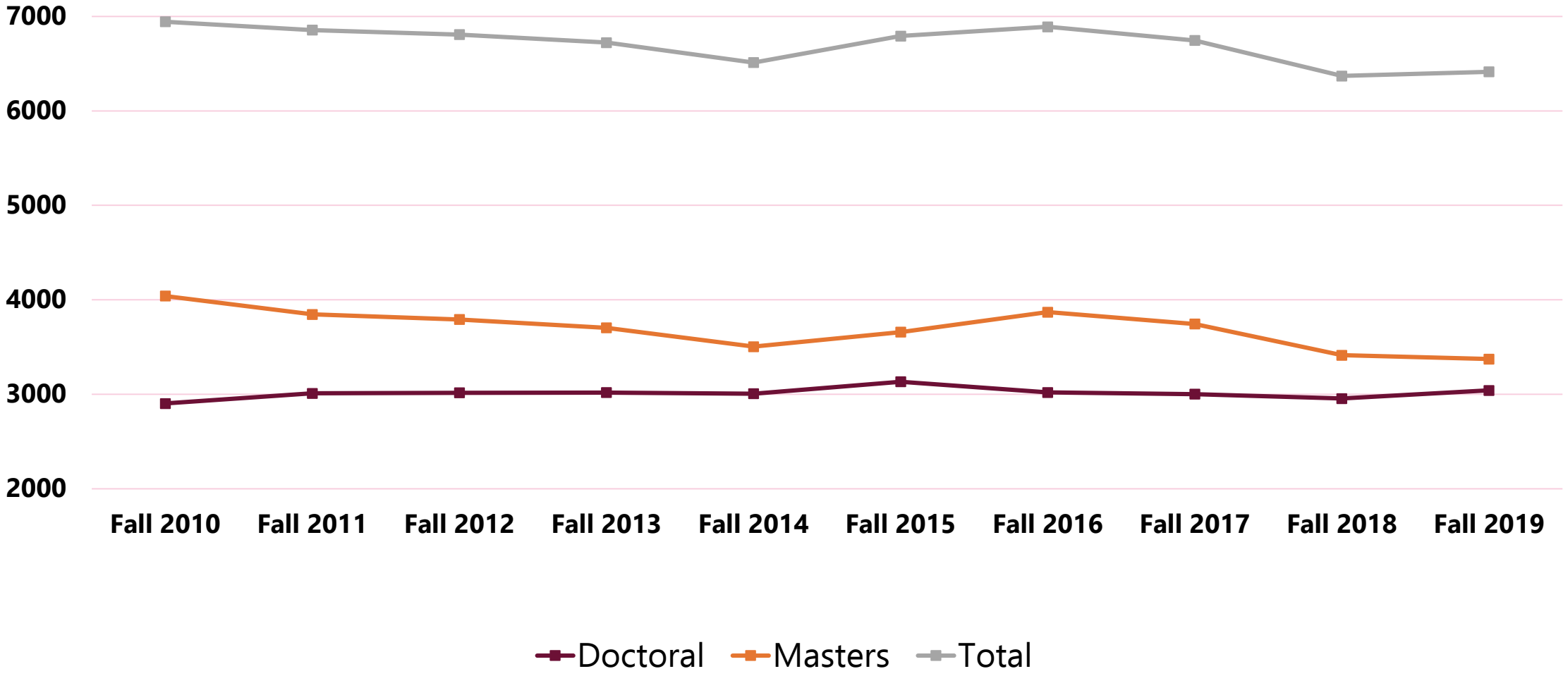
VT Graduate Enrollment Declining 2010-2019



- PhD enrollment steady, masters decline

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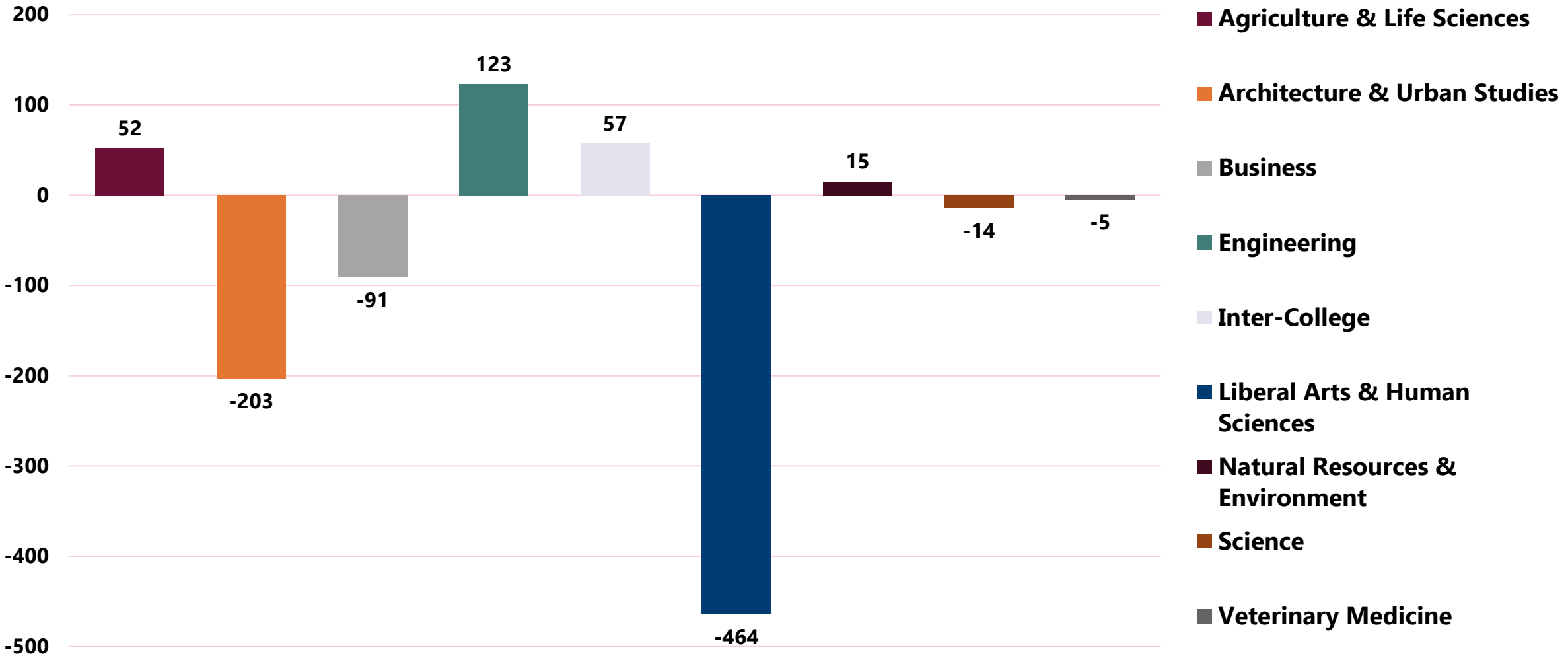
Grad Enrollment Trends by VT College 2010-19



- Key masters issues; educational accreditation changes, elimination of Blacksburg MBA, some architecture issues

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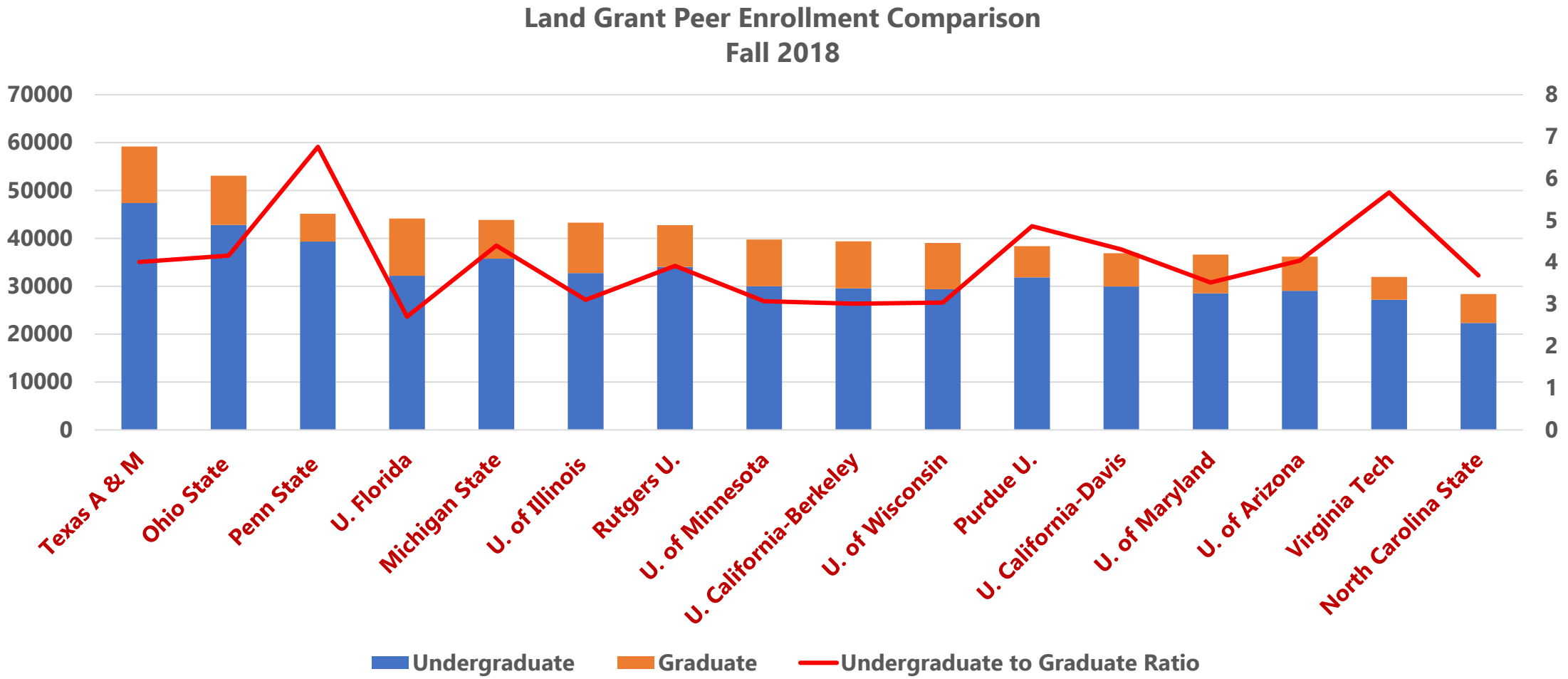
Grad vs. UG Enrollment



- VT high proportion of UGs, low number of grad students

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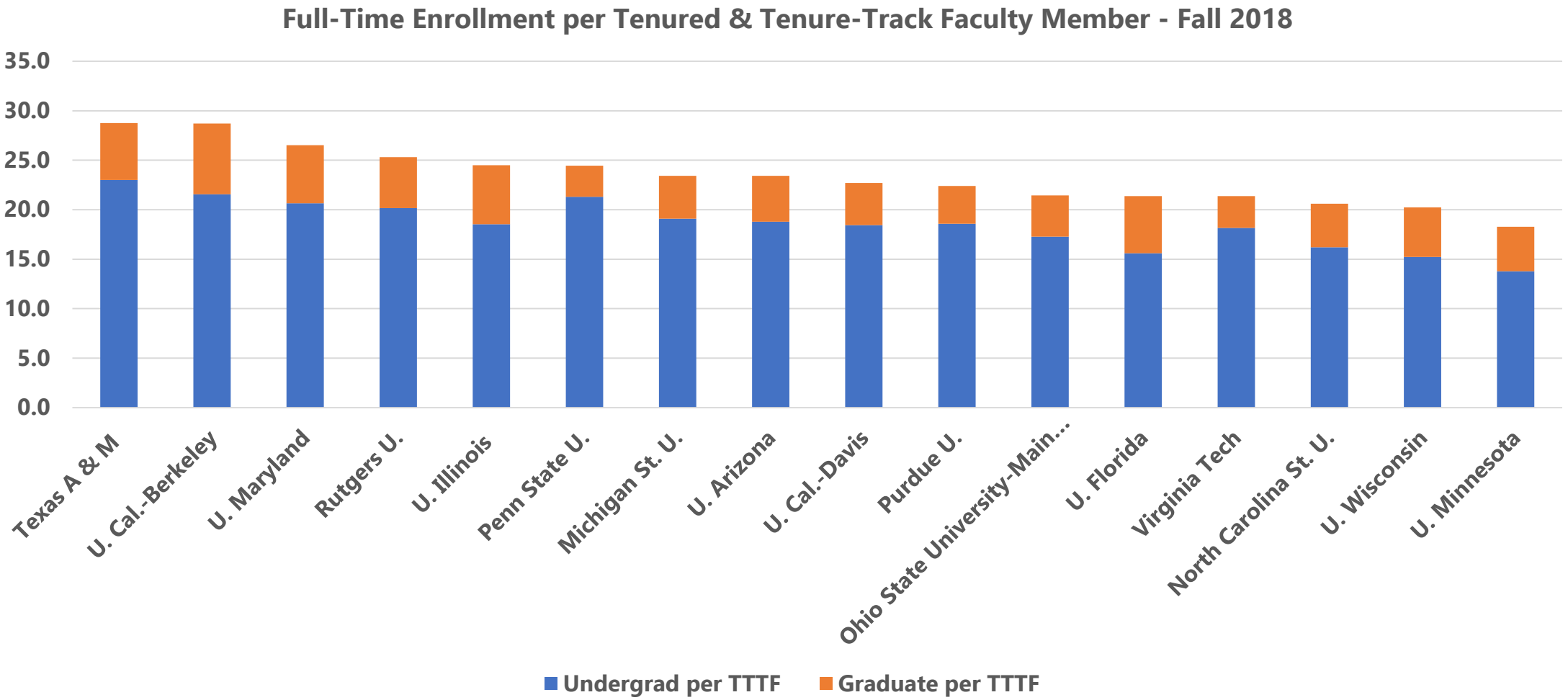
Enrollment per Tenure Track Faculty Member



- **VT grad enrollment/TTF near bottom of aspirational peers (3.2 vs. 4.9 ave.)**

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Making funding go further: Refined candidate status

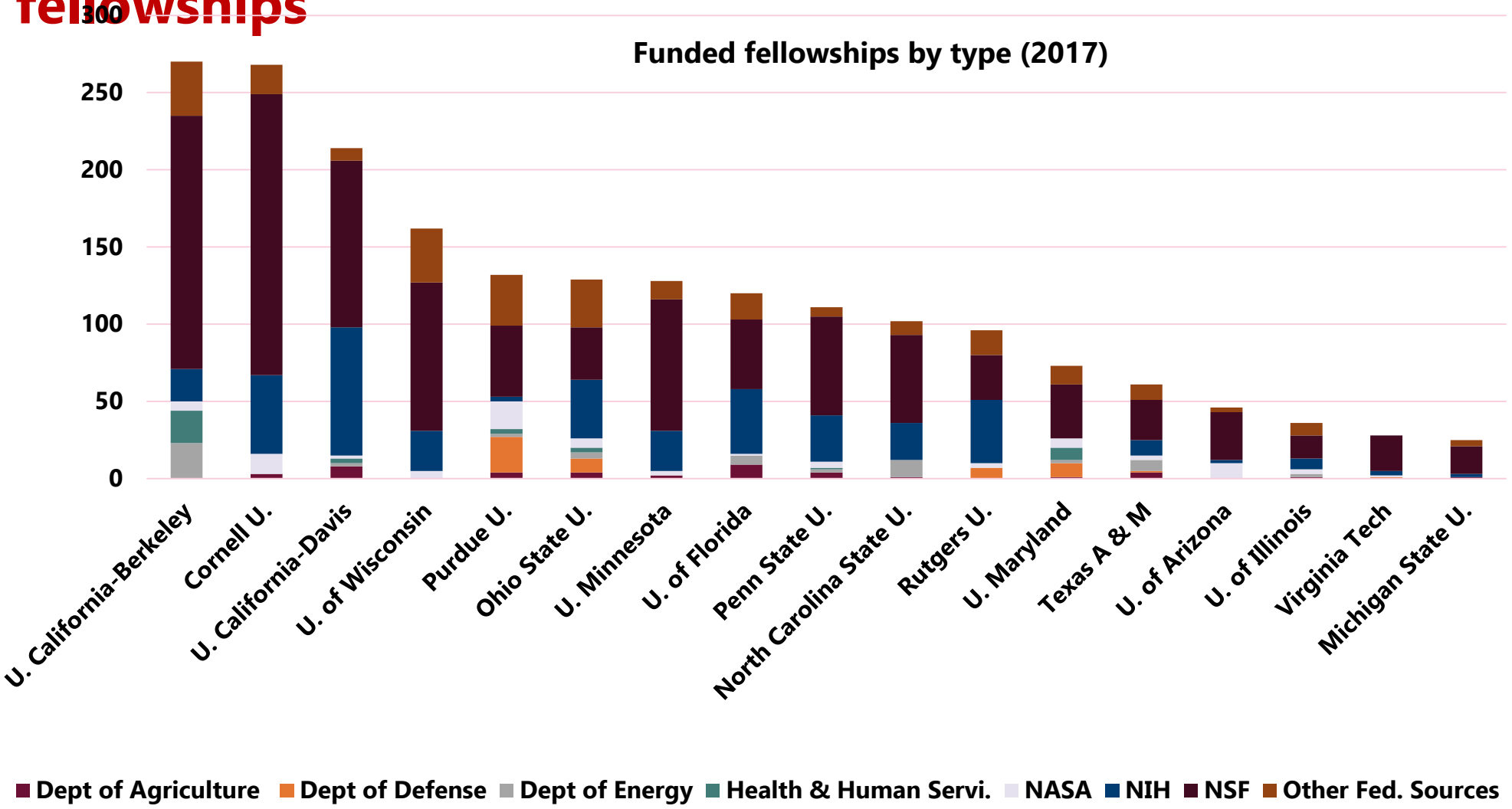
Proposed refinements on candidate status to preserve benefits to students and programs but reduce cost :

- Original approved proposal
  - 3 yrs maximum
  - Eligible after preliminary exam
  - Cost $2.7M in tuition offset by $1.9M in sponsored programs, so max. -$0.8M

- GETF proposes implementation of candidacy status as follows:
  - Eligibility starts 1 yr past preliminary exam
  - Eligible for up to 2 yrs
  - Cost estimated at max. of -$330K

- Ease financial burden on students, make external funding go further
- **Additional benefits; incentive for early prelim, reduced time to degree**

VT lags behind aspirational peers in student- initiated fellowships



- Trailing UC Davis by nearly 200, Purdue/PSU by ca. 100

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How peer institutions support student-initiated proposals

	Expect students to apply	Fellowship list	Fellowship preparation resources				Financial assistance		Perks
			Seminars/ workshops	Templates	Review mechanism	Resubmit assistance	Tuition / fees	Insurance	
UC Berkeley	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
U Minn	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Maryland	Yes	Yes	Yes	No	No	No	Yes	Yes	No
Purdue	No	Yes	Yes	No	Yes	Yes	Yes	No	No
Illinois	No	Yes	Yes	No	Yes	No	No	No	No
Cornell	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Penn St.	No	Yes	Yes	No	Yes	No	Yes	Yes	No

- Support rather than disadvantage students with initiative to write proposals (e.g. NSF GFRP)
- Support available in some VT depts/colleges; collaborate with OSP to make available university-wide?
- **Expectation may have even more impact than increased funding**

TTF Size, Research Expenditures, Expenditures/TTF All Issues

	Land Grant Univ.	THE Global Rank	Total Res. Exp. ($M)	External Res. Exp. ($M)	TTF	Ext. Research Exp. per TTF ($k)
1	U. of California, Berkeley	13	797	627	1361	461
2	Cornell U.	19	1072	797	1398	570
3	U. of Illinois	48	653	473	1762	268
4	U. of Wisconsin	51	1206	808	1924	419
5	U. of California, Davis	55	789	581	1508	385
6	Ohio St. Univ.	70	875	746	2455	303
7	Pennsylvania St. Univ.	78	908	712	1765	403
8	U. of Minnesota	79	955	650	2171	299
9	Michigan St. Univ.	84	715	427	1870	228
10	Purdue Univ.	88	632	380	1689	225
11	U. of Maryland	91	541	401	1410	284
12	U. of Arizona	104	687	473	1503	314
13	Rutgers U.	168	706	536	1794	298
14	U. of Florida	175	865	641	2451	261
15	Texas A&M	178	922	646	2015	320
16	**Virginia Tech**	**201-250**	**532**	**312**	**1482**	**210**
17	North Carolina St. U.	301-350	510	389	1375	282

- VT rank: total exp 16th; ext exp 17th; TTF 13th; ext exp/TTF 17th

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Number, Funding Sources of Doctoral Students

Full-time Doctoral Students by Count, Primary Funding Mechanism, AY2016-17.

		Funding Mechanisms						
		Assistantships						
Land Grant U.	Count	Res.	Teaching	All	Fellowship	Trainee.	Self-support	Other
U. Cal., Berkeley	4154	34%	26%	84%	33%	1.7%	4.8%	0.1%
U. of Illinois	3809	42%	28%	70%	15%	0.1%	4.3%	10.9%
U. of Wisconsin	3723	46%	24%	69%	11%	6.9%	8.5%	4.3%
U. of Cal., Davis	3063	30%	36%	66%	26%	--	5.8%	2.5%
Ohio St. U.	3170	40%	30%	70%	16%	2.1%	4.2%	7.9%
Penn. St. U.	3067	51%	28%	79%	9%	0.8%	10.9%	0.3%
U. of Minnesota	3226	45%	30%	74%	15%	3.8%	5.3%	1.3%
Michigan St. U.	2211	51%	33%	84%	9%	1.6%	5.2%	0.6%
Purdue U.	3185	58%	28%	85%	9%	0.6%	4.7%	0.7%
U. Maryland	2854	39%	36%	75%	10%	0.9%	12.5%	1.9%
U. Arizona	1654	26%	27%	53%	3%	3.0%	24.1%	16.6%
Rutgers U.	1725	26%	39%	65%	15%	1.0%	15.4%	3.8%
U. Florida	3118	39%	23%	62%	15%	0.4%	20.8%	1.9%
Texas A&M	3655	44%	33%	77%	7%	0.5%	12.1%	3.6%
NCSU	2599	57%	27%	84%	9%	--	6.0%	0.4%
Peer Ave.	**3014**	**42%**	**29%**	**72%**	**14%**	**1.6%**	**8.9%**	**3.5%**
Virginia Tech	**2148**	**53%**	**35%**	**89%**	**2.4%**	**--**	**6.2%**	**2.7%**

- Source: NSF Survey of Graduate Students and Postdocs in Science & Engineering, AY 2017

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GETF Recommendations (page 1)

1) Provide to graduate students resources to support enhanced numbers of student-initiated research proposals.

2) Make a focused effort to solicit donations for endowed graduate fellowships.

3) Increase the number and scope of self-funded graduate programs.

4) Implement modified version of Candidacy Status resolution passed by UC (spring 2019)

5) Expand mentorship training to include all new assistant professors**.**

6) Implement 360° feedback for tenure-track faculty (TTF).

7) Implement a Professional Development Graduate Certificate.

GETF Recommendations (page 2)

8) Increase minimum assistantship stipend rate to match minimum rates of VT aspirational peers.

9) Annually compare graduate stipend rates to our peers, and create incentives for colleges to maintain competitive rates.

10) Develop standard phrasing to properly convey intentions to employ graduate students for multiple years.

11) Enhance OSP support to faculty preparing research funding proposals.

12) Co-locate OSP staff in colleges and enhance agency-specific expertise and relationships.

13) Adopt a hybrid model where the Graduate School assists departments and programs to improve graduate recruiting.

14) Enhance role of Grad School in graduate program review and evaluation for continuous improvement.

Graduate Education Task Force Final Report

- THANK YOU to all participants; GETF members, our student panels, and our survey responders

- Thank you for your attention; any questions?

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Task force charged (by Provost, VP & Dean Grad Ed) to address:

- Conduct a comparative analysis (relative to peer land grant universities) of:
  - Virginia Tech research-based graduate education programs, with particular attention to applications, admissions, enrollment, and student success outcomes (retention, time to candidacy status, time to degree completion);
  - the cost of research-based graduate education programs to students, Virginia Tech, and extramurally-funded grants and contracts; and
  - the national reputations of individual graduate degree programs.
- Recommend metrics, milestones to evaluate & track progress accomplished in grad program dev.
- Consider and, if appropriate, recommend policy revisions and other actions that will reduce the cost of graduate education and drive enrollment. Please note one such action related to differential tuition for students with candidate status has already received a supportive recommendation from University Council (Resolution CGSP 2018-19D).
- Consider, recommend policy revisions to stipulate importance of grad student mentorship for P&T.
- Consider, recommend strategies to incentivize faculty, acad. units to increase grad ed engagement
- Recommend other actions with potential to advance size & quality of research-based grad ed.

(lightly edited for length)

Membership of the GETF

Name	Affiliation	Role
Rajesh Bagchi	Dept. Head, Marketing, Pamplin Coll. Bus.	Member
Kevin Edgar	Assoc. Dean, Grad School	Chair
Dennis Dean	Director, Fralin Life Sci. Inst.	Member
Jeff Earley	Assoc. V.P., Finance	Member
Tom Ewing	Assoc. Dean, CLAHS	Member
Samantha Fried	Pres., Grad. Student Assembly	Member
Glenda Gillaspy	Dept. Head, Biochemistry	Member
Randy Heflin	Assoc. Dean, Research, COS.	Member
Eric Kaufman	Faculty Senate	Member
Kacy Lawrence	Dir. of Assessment, Grad School	Member
Margie Lee	Dept. Head, Biomed. Sci. & Pathobiology, CVM	Member
Theresa Meyer	VP, Research	Contributor
Nancy Ross	Dept. of Geosciences, COS	Member
Neil Sedlak	Dir. Info. Tech., OVPRI	Member
Brennan Shepard	Dir. Financial Planning	Member
Cortney Steele	VT GrATE Fellow	Member
Kenneth Wong	Assoc. Dean, Grad School, Nat. Cap. Region	Member
G. Don Taylor	VP Research	Contributor

External Research Expenditures per GRA

Land Grant Univ.	THE Global Rank	Res. Exp. ($M)	GRAs	Res. Exp. / GRA ($)
Purdue U.	64	449.3	2856	157,318
Virginia Tech	251-300	296.6	1638	181,074
U. of Illinois	50	469.4	2583	181,727
North Carolina St. U.	251-300	380.4	1801	211,216
Michigan St. U.	93	437.6	1758	248,919
U. of Florida	156	579.9	2205	262,993
U. of Minnesota	71	621.2	2316	268,221
U. of Wisconsin	43	799	2666	299,700
U. of Maryland	82	412.6	1180	349,661
Ohio St. U.	71	737	1903	387,283
U. California – Berkeley	15	602.7	1546	389,845
U. California – Davis	59	541.2	1289	419,860
Texas A&M U.	171	640.7	1375	465,964
U. of Arizona	159	435	875	497,143
Cornell U.	19	723.6	1093	662,031
Pennsylvania St. U.	81	676.3	846	799,409
Rutgers U.	176	517.8	444	1,166,216

- VT second most efficient in expenditure/GRA

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Number and funding sources of doctoral students

Full-time Doctoral Students by Count and Primary Funding Mechanism at Selected Institutions in AY2016-17.

		Funding Mechanisms						
		Assistantships			Fellow-	Trainee-	Self-	
Institution	Count	Research	Teaching	All	ship	ship	Support	Other
Michigan State University	2,211	51.0%	32.9%	83.9%	8.8%	1.6%	5.2%	0.6%
North Carolina State University	2,599	56.9%	27.2%	84.1%	9.4%		6.0%	0.4%
Ohio State University, The	3,170	39.8%	30.5%	70.3%	15.6%	2.1%	4.2%	7.9%
Pennsylvania State University, The	3,067	51.2%	28.2%	79.4%	8.7%	0.8%	10.9%	0.3%
Purdue University	3,185	57.7%	27.6%	85.3%	8.6%	0.6%	4.7%	0.7%
Rutgers, The State University of New Jersey	1,725	26.1%	38.7%	64.8%	15.0%	1.0%	15.4%	3.8%
Texas A&M University	3,655	43.6%	33.0%	76.6%	7.2%	0.5%	12.1%	3.6%
University of Arizona, The	1,654	26.5%	26.8%	53.4%	3.0%	3.0%	24.1%	16.6%
University of California, Berkeley	4,154	33.7%	26.5%	60.2%	33.2%	1.7%	4.8%	0.1%
University of California, Davis	3,063	29.8%	36.3%	66.1%	25.6%		5.8%	2.5%
University of Florida	3,118	39.3%	22.6%	61.9%	15.0%	0.4%	20.8%	1.9%
University of Illinois at Urbana-Champaign	3,809	42.5%	27.5%	70.0%	14.8%	0.1%	4.3%	10.9%
University of Maryland, College Park	2,854	39.0%	36.2%	75.2%	9.5%	0.9%	12.5%	1.9%
University of Minnesota	3,226	44.7%	29.6%	74.3%	15.3%	3.8%	5.3%	1.3%
University of Wisconsin-Madison	3,723	45.6%	23.8%	69.4%	10.9%	6.9%	8.5%	4.3%
Peer Average	3,014	42.4%	29.4%	71.8%	14.2%	1.6%	8.9%	3.5%
Virginia Polytechnic Institute and State University	2,148	53.4%	35.4%	88.7%	2.4%		6.2%	2.7%

Source: National Science Foundation, Survey of Graduate Students and Postdoctorates in Science and Engineering, Academic Year 2017

- VT second lowest # of science, engineering, health doctoral students

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