



The higher education landscape 2023

Nathan Urban - presentation to Lehigh Faculty Senate



Environment for higher education - external drivers

- Demographics will result in reduced demand for undergraduate education, especially in the northeast
- Increased competition means that cost of college is becoming more of an issue
- Public opinion about higher education is increasingly negative
- Availability of low cost online courses - threat or opportunity?
- How should what we teach be influenced by technology?

HIGHER EDUCATION

College enrollment declines for third straight year since pandemic

Report finds undergraduate count is off about 7 percent since fall 2019



By Nick Anderson

Updated October 20, 2022 at 11:58 a.m. EDT | Published October 20, 2022 at 12:05 a.m. EDT



A person walks on the campus of the University of Virginia in Charlottesville in September 2020. (John McDonnell/The Washington Post)

MOST READ EDUCATION >



1 Parents allege 'overly punitive' Stanford discipline led to soccer star's suicide

2 Teens embrace AP class featuring Black history, a subject under attack



3 Stanford investigates its president for possible research misconduct



4 As enrollment falls and skepticism grows, some colleges are cutting prices



Listen 3 min



Comment 228



Gift Article



Share

Enrollment Projections

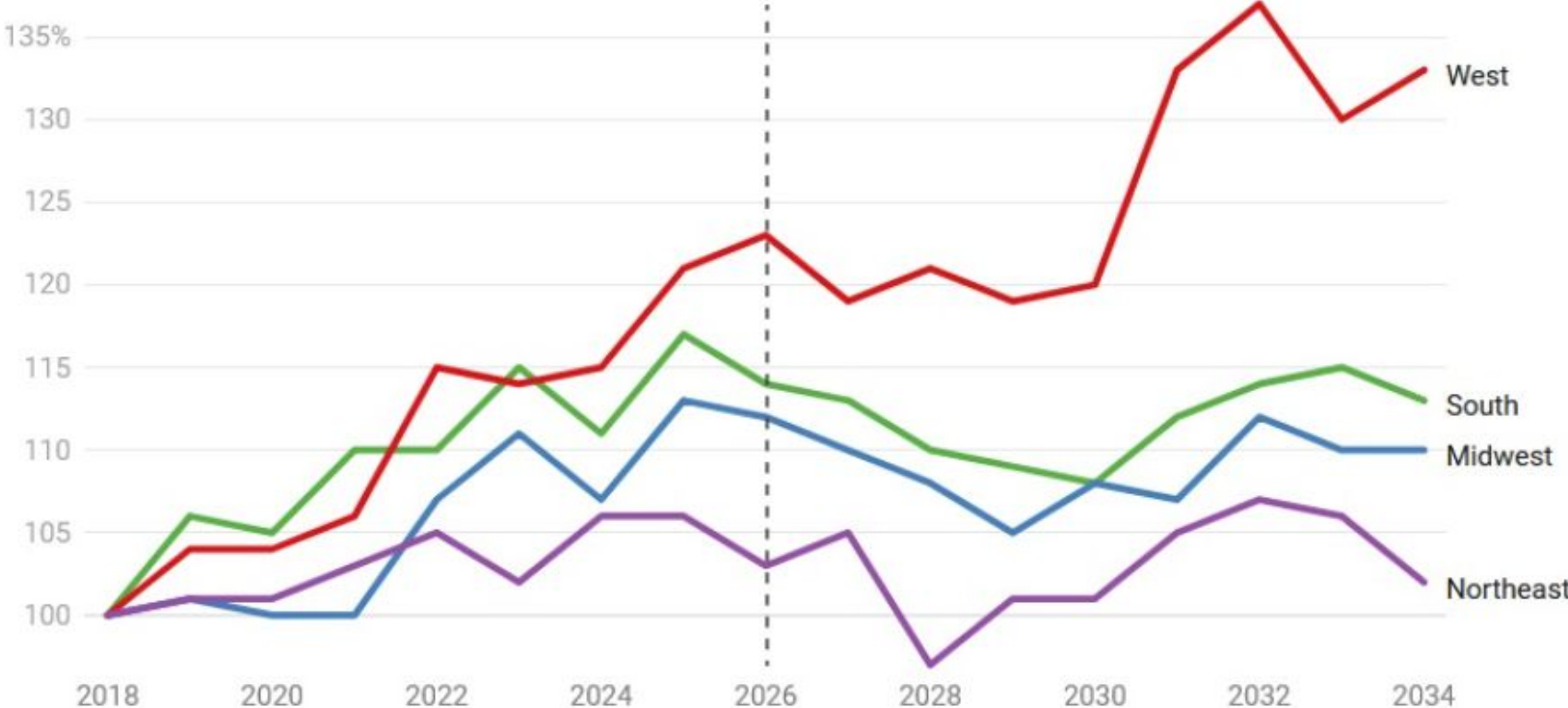
4-Year National Colleges USNWR #51-100



Source: Nathan D. Grawe, "The Agile College" • Get the data • Created with Datawrapper

Enrollment Projections

4-Year Elite Colleges USNWR top 50



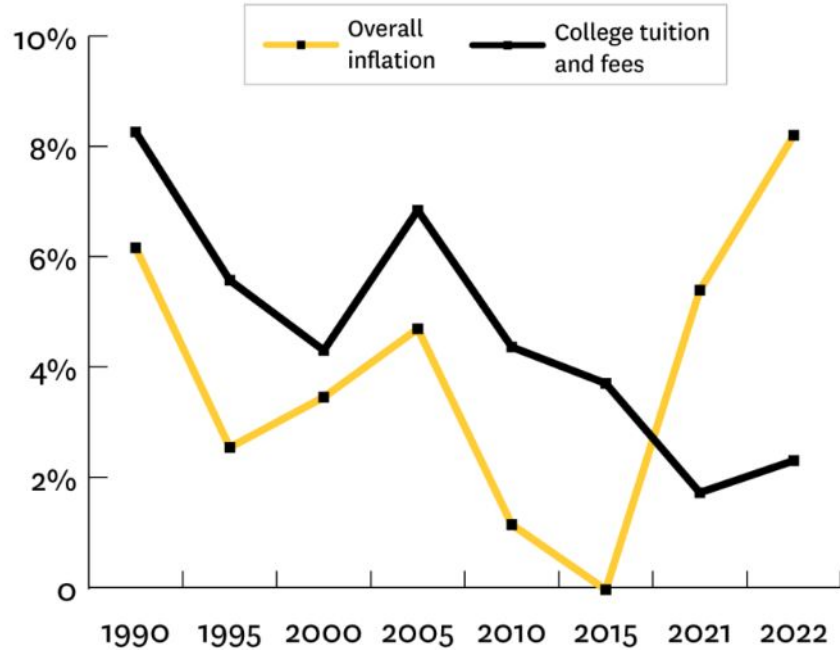
Source: Nathan D. Grawe, "The Agile College" • [Get the data](#) • Created with [Datawrapper](#)

NEWS

As enrollment falls and grows, some colleges are prices

The cost of college has stopped rising faster than inflation for the first

by **JON MARCUS** November 25, 2022



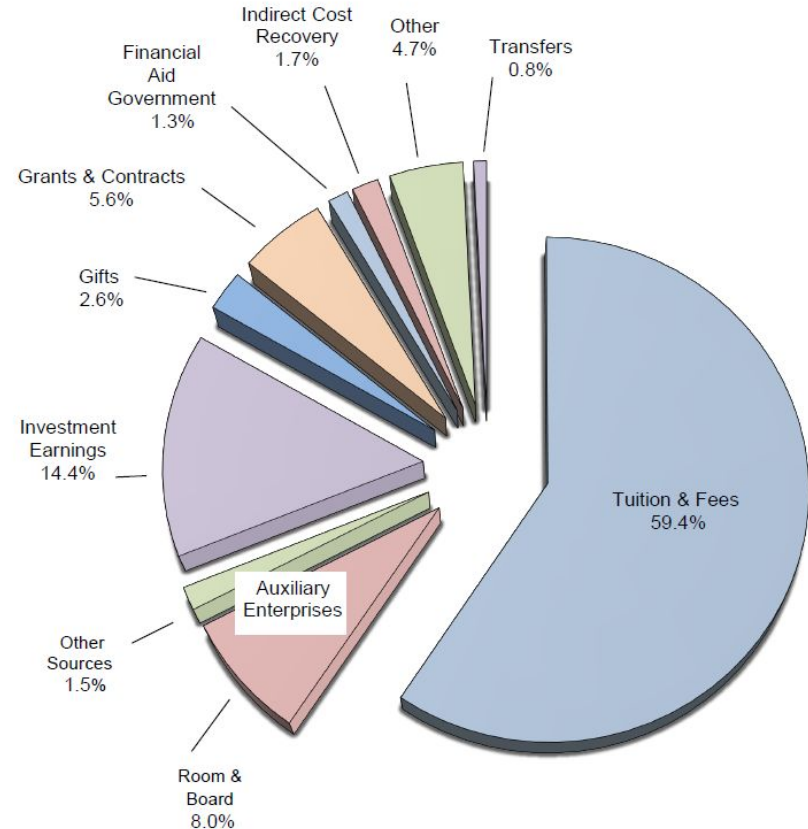
Source: Bureau of Labor Statistics, data from September each year

Lehigh Revenue Sources FY 2022 (budgeted)

\$580,429,250



Main revenue sources:

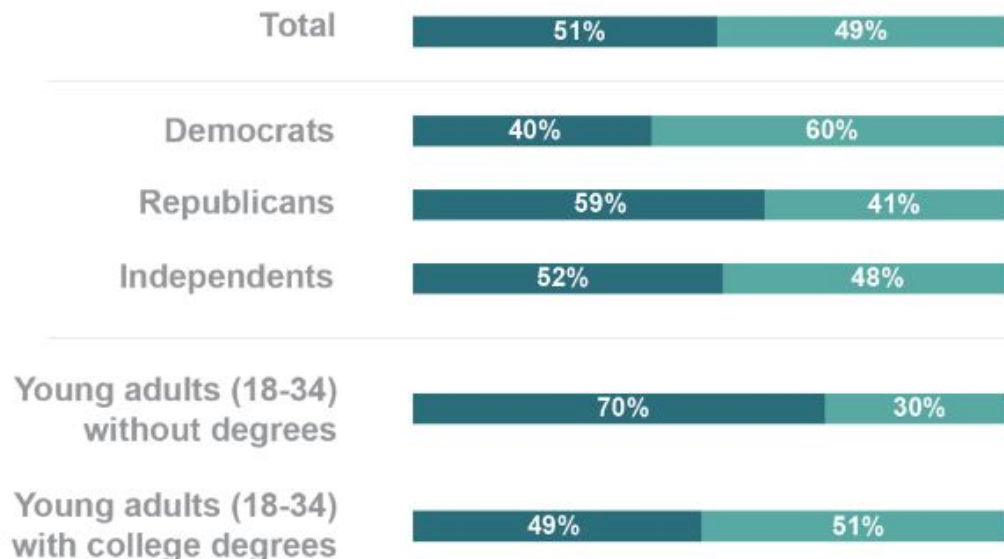
- 70% of revenue is from gross tuition + room and board + other auxiliaries (e.g. parking, bookstore, etc)
- 17% is from return on endowment and current year gifts
- 7% is direct and indirect funding of research



Americans Perceive Higher Ed as a Questionable Investment

Which of the following statements come closest to their view of a college education?

-  A college education is a questionable investment because of high student loans and limited job opportunities
-  A college education is still the best investment for people who want to get ahead and succeed



How do we ensure that a Lehigh Education is valuable?

Economically
And in terms of intellectual growth

How do we convince others that this is true?

Economically
And quality of the student experience

Or should we reduce the cost of a Lehigh education?

If so, how?

Development > Data Science > Financial Analysis

Python & Machine Learning for Financial Analysis

Master Python Programming Fundamentals and Harness the Power of ML to Solve Real-World Practical Applications in Finance

4.3 ★★★★★ (4,015 ratings) 96,528 students

Created by [Dr. Ryan Ahmed, Ph.D., MBA, Mitchell Bouchard](#)

🕒 Last updated 7/2022 🌐 English 🗣️ English [Auto]



Preview this course

Personal

Teams

\$14.99 ~~\$84.99~~ 82% off

🕒 5 hours left at this price!

Buy this course

30-Day Money-Back Guarantee
Full Lifetime Access

[Share](#) [Gift this course](#) [Apply Coupon](#)

or

Subscribe to Udemy's top courses

Get this course plus top-rated picks in Data Science and other popular topics. [Learn more](#)

What you'll learn

- ✓ Master Python 3 programming fundamentals for Data Science and Machine Learning with focus on Finance.
- ✓ Understand the theory and intuition behind Capital Asset Pricing Model (CAPM)
- ✓ key Python Libraries such as NumPy for scientific computing, Pandas for Data Analysis, Matplotlib/Seaborn for data visualization.
- ✓ Understand how to leverage the power of Python to apply key financial concepts such as calculating daily portfolio returns, risk and Sharpe ratio.
- ✓ Understand how to use Jupyter Notebooks for developing, presenting and sharing Data Science projects.
- ✓ Master SciKit-Learn library to build, train and tune machine learning models using real-world datasets.

[Show more](#) ▾

What do students need to learn to succeed?

Facts/information is readily available and accessible

Some skills are being automated

“Kai-Fu Lee, AI expert and CEO of Sinovation Ventures, wrote in a 2018 essay that 50 percent of all jobs will be automated by AI within 15 years. “Accountants, factory workers, truckers, paralegals, and radiologists — just to name a few — will be confronted by a disruption akin to that faced by farmers during the Industrial Revolution,” Lee wrote.”

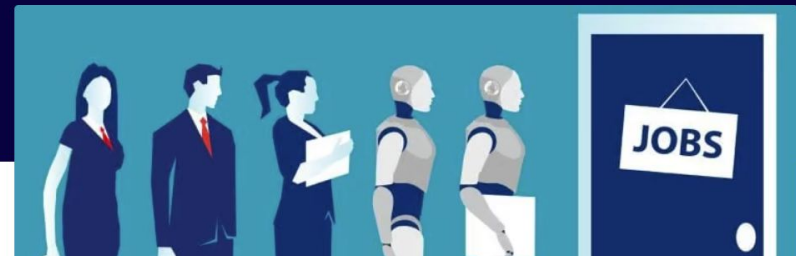
ARTIFICIAL INTELLIGENCE ROBOTICS

Robots and AI Taking Over Jobs: What to Know About the Future of Jobs

Artificial intelligence is poised to eliminate millions of current jobs – and create millions of new ones.



Written by [Mike Thomas](#)



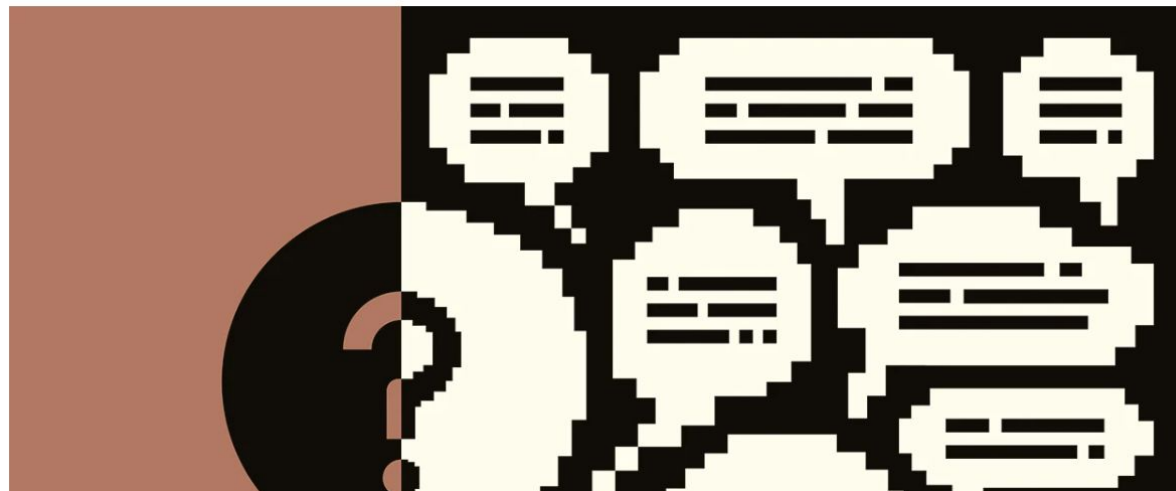
[nature](#) > [technology features](#) > article

TECHNOLOGY FEATURE | 31 October 2022

Could AI help you to write your next paper?

Large language models can draft abstracts or suggest research directions, but these artificial-intelligence tools are a work in progress.

[Matthew Hutson](#)



WORK

AI writing is here, and it's worryingly good. Can writers and academia adapt?

While AI writing is still in its early stages and far from perfect, it's clear that it poses a threat to the livelihood of professional writers. After all, if a machine can produce text that is indistinguishable from that of a human writer, why would anyone need to hire a real person to do the job?

It's not just low-skilled jobs like content writing that are at risk of being automated by AI. Even highly skilled jobs like journalism and novel-writing could eventually be replaced by machines. In fact, one Japanese company has already developed an AI system that can write novels better than humans.

Of course, it will be some time before AI writing becomes good enough to completely replace human writers across all genres and formats. But as the technology continues to improve, the day when machines can do our jobs better than we can is fast approaching.



WHAT'S NEW IN
PUBLISHING



[Home](#) [Topics](#) [Events](#) [Resources](#) [Contact](#) [The Alliance](#)

[Home](#) / [Digital Innovation](#) / [The Washington Post's robot reporter has published 850 articles in t](#)

Digital Innovation

1 min read

The Washington Post's robot reporter has published 850 articles in the past year

By WNIP  5 years ago



OPINION

OPINION: A master's degree gives students an edge with fast-moving technology

Students need more training than a bachelor's degree to thrive in today's labor market competition

by OLIVER YAO | January 17, 2022



WSJ Pro

Bankruptcy

Central Banking

Private Equity

Venture Capital

More

Economic Forecasting Survey

Economy Video

Sections

Capital Account

Employers Rethink Need for College Degrees in Tight Labor Market

Google, Delta Air Lines and IBM have reduced requirements for some positions



SUCCESS · FUTURE OF WORK

LinkedIn's CEO says skills are replacing a college degree in this job market

BY JANE THIER

November 23, 2022 at 12:18 PM EST



Most Popular

FINANCE

Fed Chair Powell: U.S. 'housing bubble' formed during the pandemic and now 'the housing market will go through the...



December 1, 2022



Questions?



Trends/drivers

Public skepticism/lack of trust in higher education

- Affordability
- Value/ROI
 - Relevance of what students learn
 - Rise of alternatives
 - Universities are not responsive to market demands
- Politics
- Rise of alternatives

Employer skepticism

- Graduates are not prepared
- Alternatives
- Yet talent is more important than ever
-

Competition

- 12\$ courses
- Google, Amazon, Salesforce, others offering education
- Less need for a degree

Need/ability to learn just in time

- How should that impact higher education? And what we should teach?

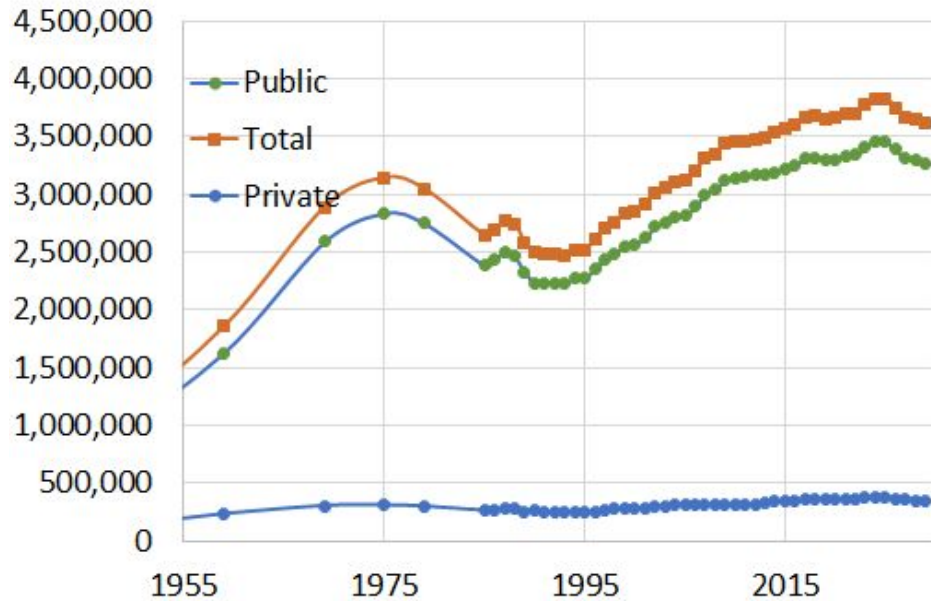
Technology

- AI - How will these affect education? How will these affect the jobs of the future?
 - GPT-3
 - Dall-E
- Metaverse VR/AR
- Pharma, biotechnology
- Drones
- Digital access - what are libraries for?
- Importance of simulation and need for experiments
- Large scale data collection efforts
- Electrification/decarbonization

Learning science

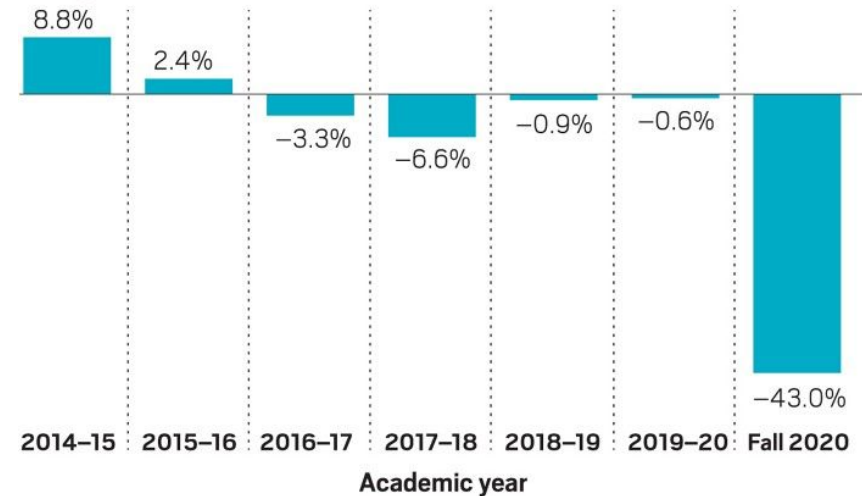
Potential undergrad applicants are declining

US Highschool Graduates



International student enrollment in US

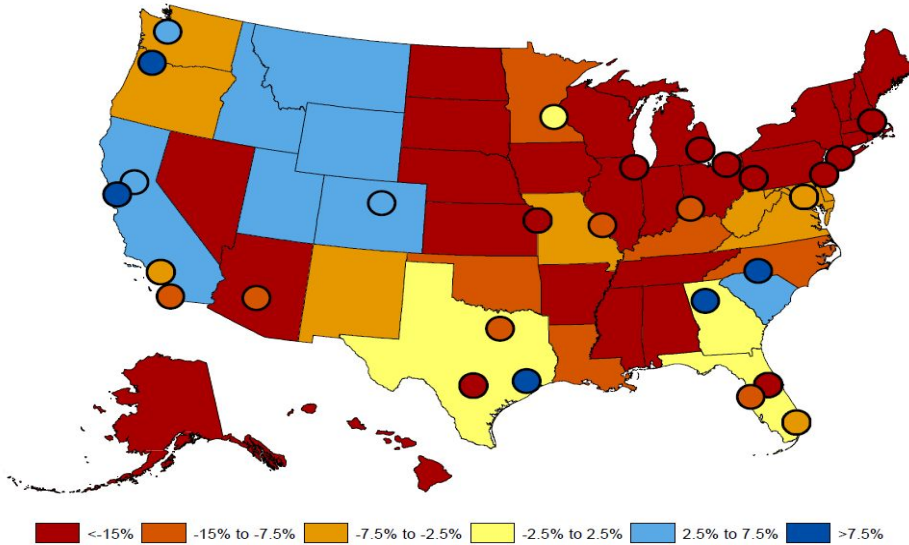
Change in enrollment of new international students, %



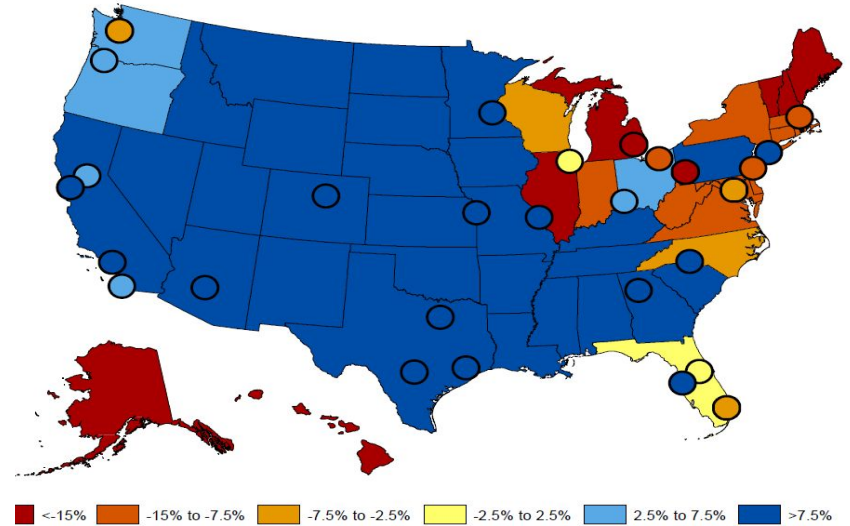
<https://cen.acs.org/education/International-student-enrollment-US-institutions/98/i45>

Change in Undergraduate Enrollment: 2012 to 2029

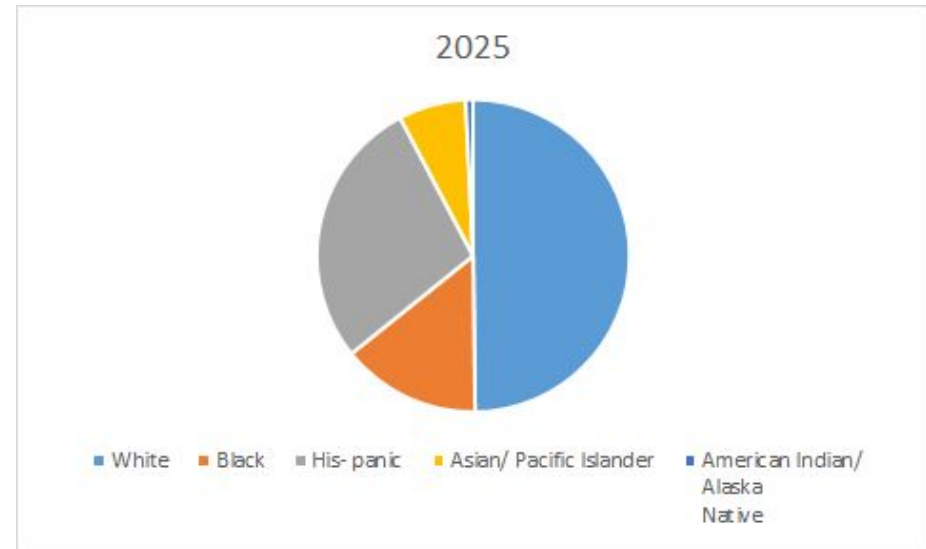
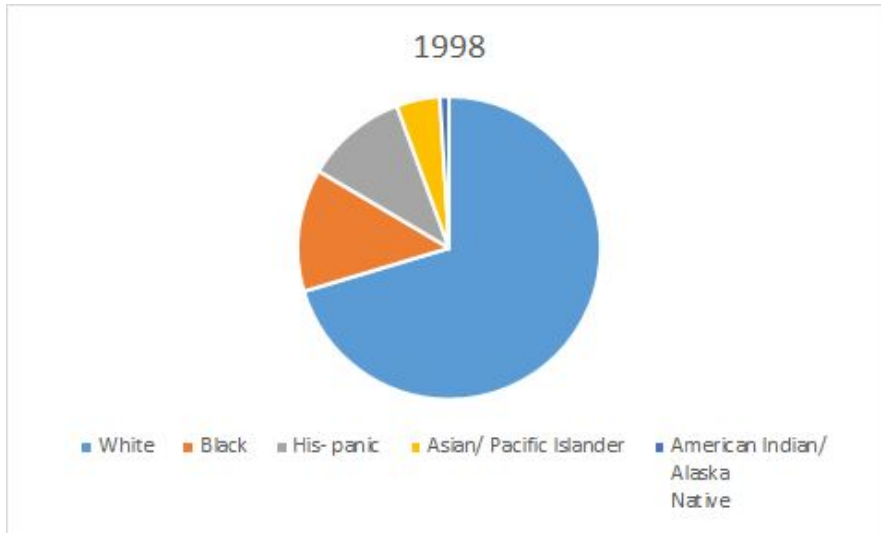
Regional Universities



Top 50 National Universities



Demographics of higher education are changing





Demand for graduate and professional education is increasing

- Projected 50% increase in demand by 2030 (NCES)
 - Even with declines in international students
- Professional students are very career focused
- Expectations for remote and hybrid learning are high
- Programs must keep up with changing demands
- Non-degree credentials (certificates, exec education, etc) are important



What is Lehigh's current position?

Strengths

- Lehigh is a STEM-focused comprehensive research university
- Lehigh is ranked 49 by USNWR and 58 by WSJ/THE
- **ROI for undergrad degree is very strong (Rank = 27)**
- Faculty value quality teaching more than most research universities
- Experiential learning programs are well-developed

Weaknesses

- Retention/graduation outcomes are at/below peer group
- **Scale and reputation of research is below peer research universities**
- Yield of accepted students has been weakening, especially given growth plans
- Graduate and especially professional programs are small and uneven in their competitiveness
- We don't have the connection with students typical of small liberal arts colleges
- College enrollment trends do not match our historical strengths (geography, race/ethnicity, gender)

Summary:

- We are currently somewhat of a hybrid of a research university and a liberal arts college
- We provide very strong ROI for graduates
- We must **significantly expand research to enhance reputation as a national research university** even as we **personalize and enhance the undergraduate student experience**

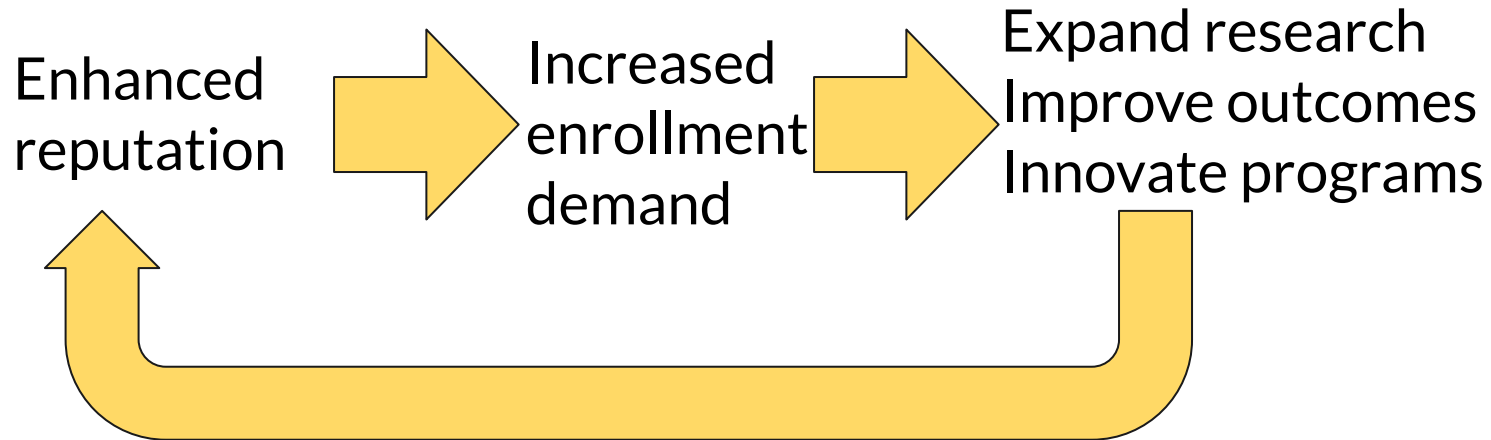


How can we improve our competitive position?

- **Better student outcomes (contributes 27% of USNWR)**
 - Graduation, retention and indebtedness rates
- **Enhance reputation and faculty resources (20+% of USNWR)**
 - Research is a key component of peer reputation
 - Student satisfaction is a key component of broader reputation
 - Expand and integrate experiential learning
- **Build on experience in remote/online education**



Academic quality drives demand





Current undergraduate enrollment pipeline

14K applications

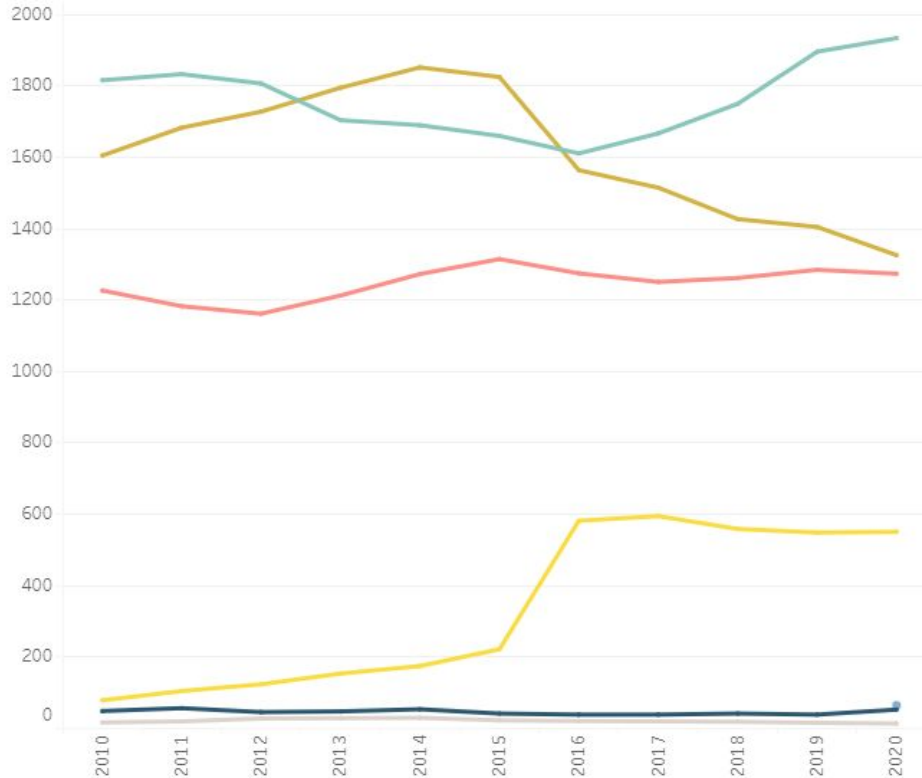
6.4K acceptances

23% yield, by 12% yield from regular decision

40% discount rate



Enrollment by Year per Selected Demographics



SELECT DEMOGRAPHIC CATEGORY HERE

Selected Demographic

- Arts & Sciences
- Arts Engineering
- Business
- Engineering & Applied Science
- General College Division
- Health
- Intercollegiate Programs

Select Table Metric

Demographics by Year

Selected Demographic	2010	2011	2012	2013	2014
Arts & Sciences	1,814	1,831	1,805	1,702	1,688
Arts Engineering	47	55	44	46	52
Intercollegiate Programs	77	103	122	152	173
Engineering & Applied Science	1,603	1,681	1,726	1,793	1,850
General College Division	15	18	26	27	28
Business	1,225	1,181	1,160	1,211	1,271
Health					
Grand Total	4,781	4,869	4,883	4,931	5,062

4 Year graduation rate

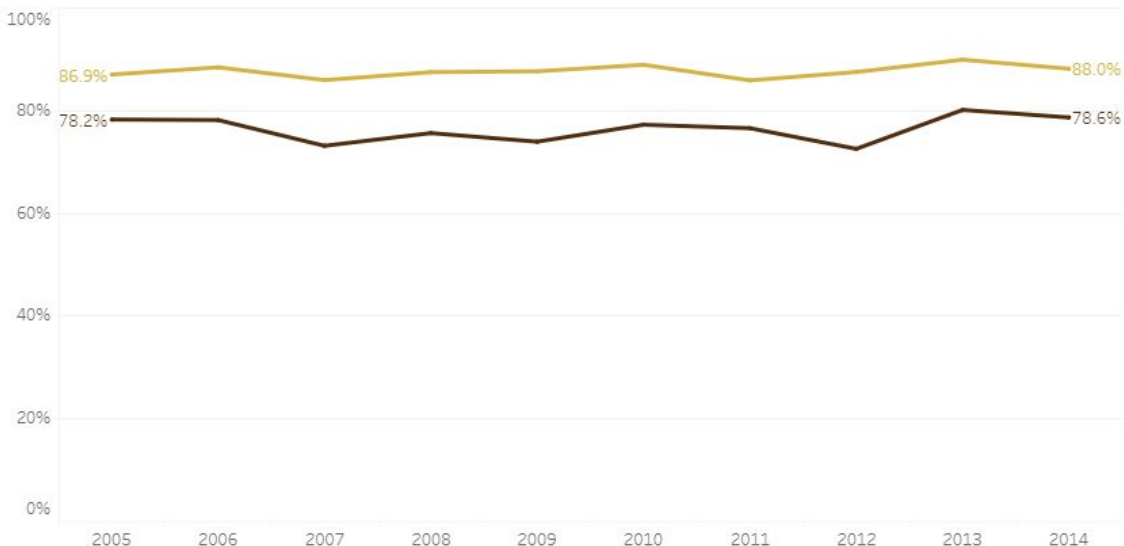
#1 Washington and Lee	92%
Georgetown	91%
Notre Dame	91%
Boston College	90%
Princeton	90%
University of Chicago	90%
Vanderbilt	90%
Washington U	89%
Johns Hopkins	88%
.....	
Rice	84%
Wake Forest	84%
Emory	82%
.....	
>#150 Lehigh	80%

Graduation Rates - overview

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of Students	1,223	1,217	1,165	1,205	1,189	1,208	1,203	1,216	1,197	1,297
Four Year Graduation Rate	78.2%	78.1%	73.0%	75.5%	73.8%	77.2%	76.5%	72.5%	80.0%	78.6%
Six Year Graduation Rate	86.9%	88.3%	85.8%	87.4%	87.6%	88.8%	85.8%	87.4%	89.8%	88.0%

■ Four Year Graduation Rate
 ■ Six Year Graduation Rate

Evolution of Four-Year and Six-Year Graduation Rates

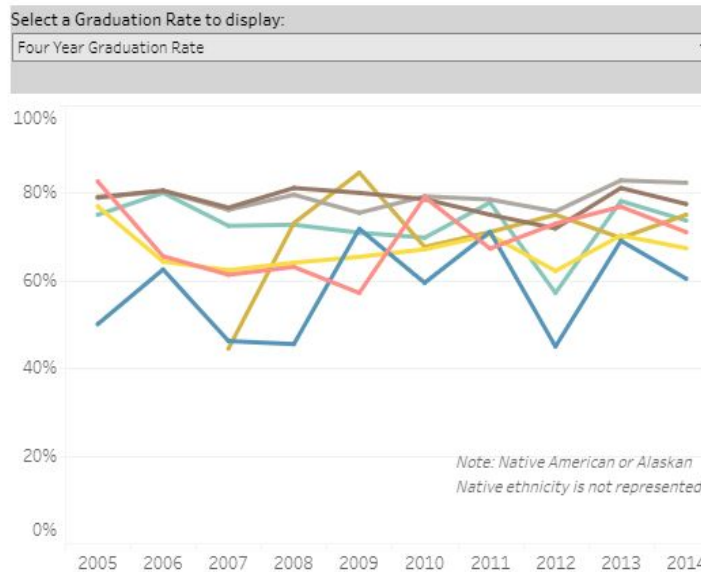


Data are displayed by entering cohort (cohorts are revised due to allowed exclusions).

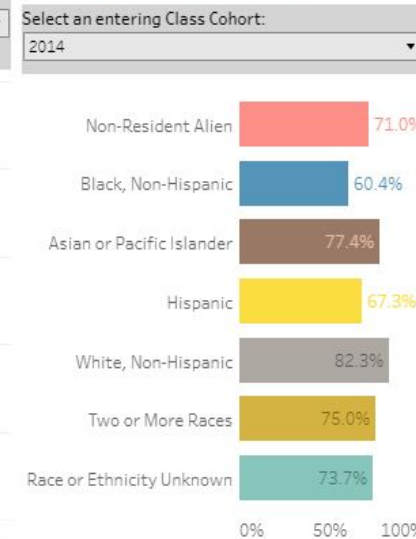
4 Year graduation rate by race/ethnic

■ Non-Resident ... ■ Asian or Pacific... ■ White, Non-His... ■ Race or Ethnici...
■ Black, Non-His... ■ Hispanic ■ Two or More R...

Evolution of Selected Graduation Rate by ethnicity:



Selected Graduation Rate in Selected Entering Cohort by Ethnicity:



Data are displayed by entering cohort (cohorts are revised due to allowed exclusions).

4 Year graduation rate by financial aid category

■ Received Federal Pell Grant
 ■ Received Subsidized Stafford Loan (No Pell)
 ■ Received Neither Pell Grant or Stafford Loan

Evolution of Selected Graduation Rate by Financial Aid Category:

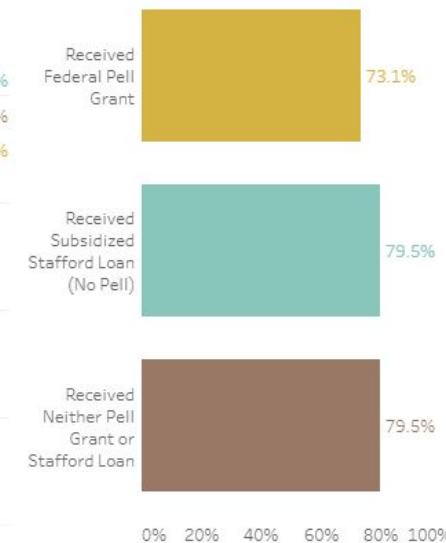
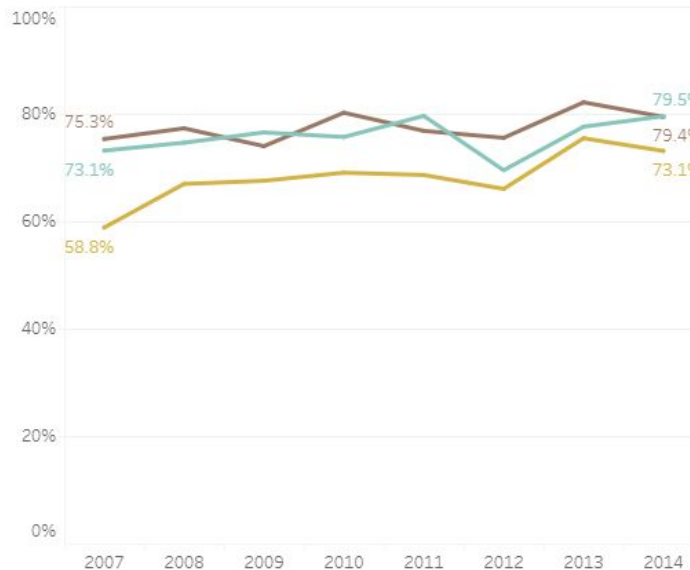
Select a Graduation Rate to display:

Four Year Graduation Rate

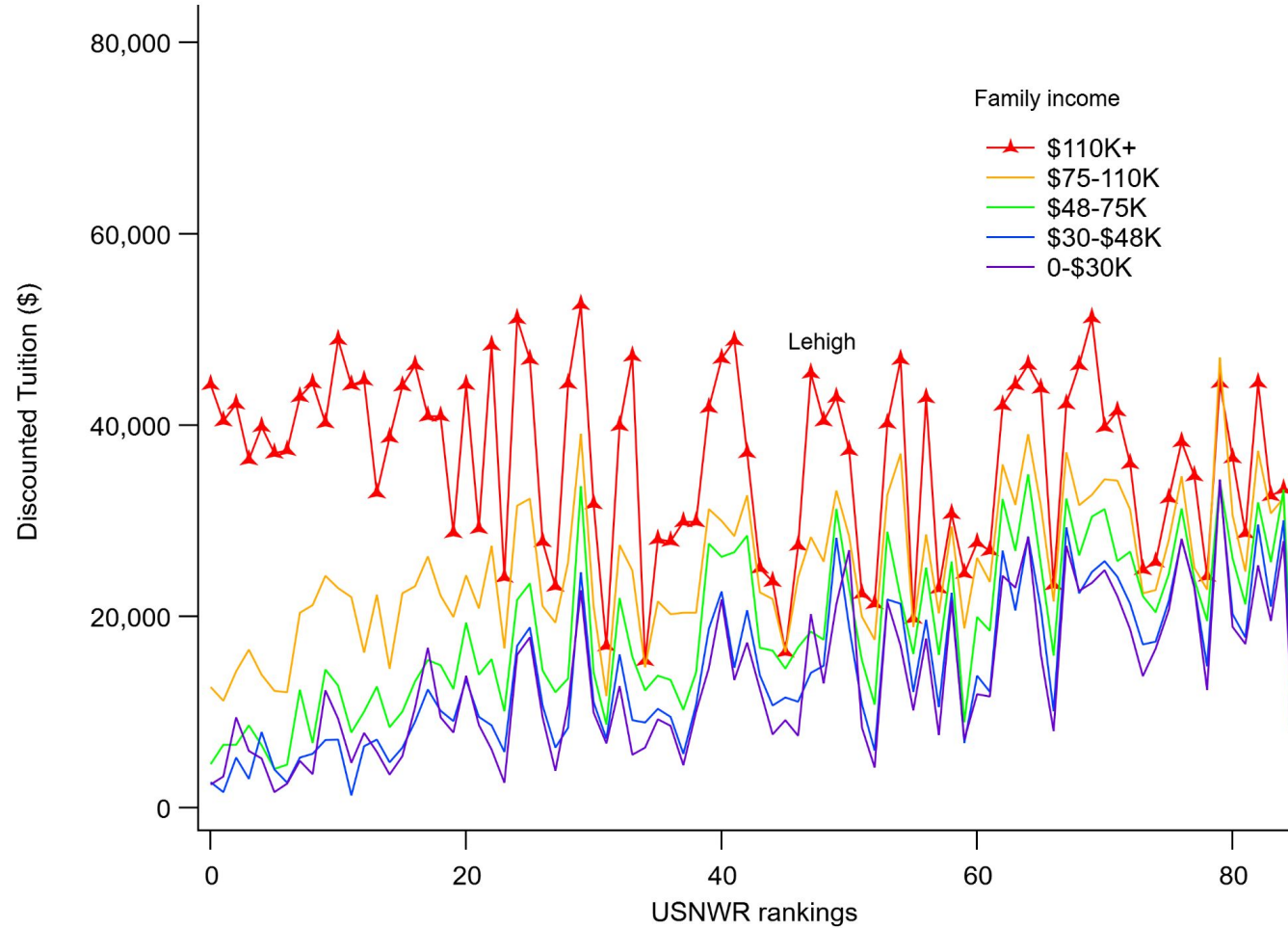
Selected Graduation Rate in Selected Entering Cohort by Financial Aid Category:

Select an entering Class Cohort:

2014



Data are displayed by entering cohort (cohorts are revised due to allowed exclusions).

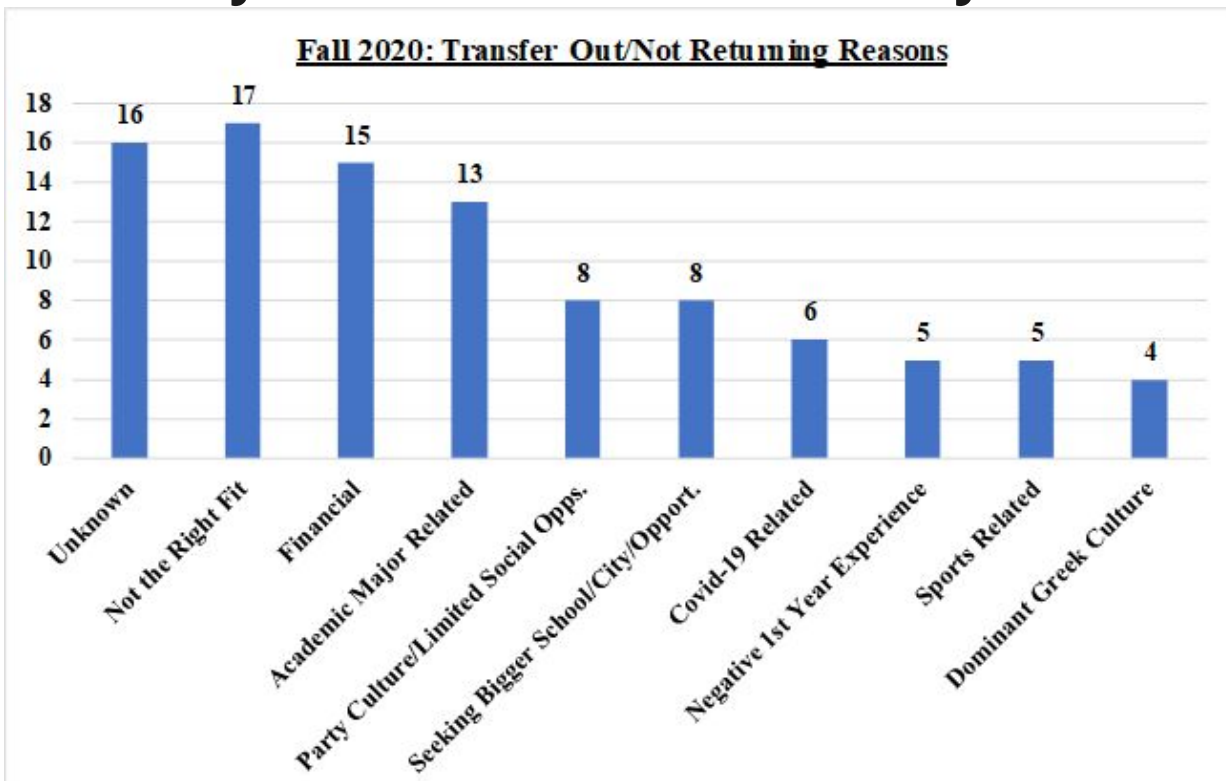




Why do students not graduate in 4 years or leave?

- Demographic predictors
 - Gender, race, income
- Survey data
 - What are the reasons that students give?
- Largely **not** due to academic struggles

Why have students left this year?



Other:

- Closer to home/family
- Lehigh's learning environment
- Military
- Lehigh' response to George Floyd's murder
- Underfunded support centers

GPA of leaving students is 3.5 vs 3.35 for remaining students

Improving retention also enhances net tuition.

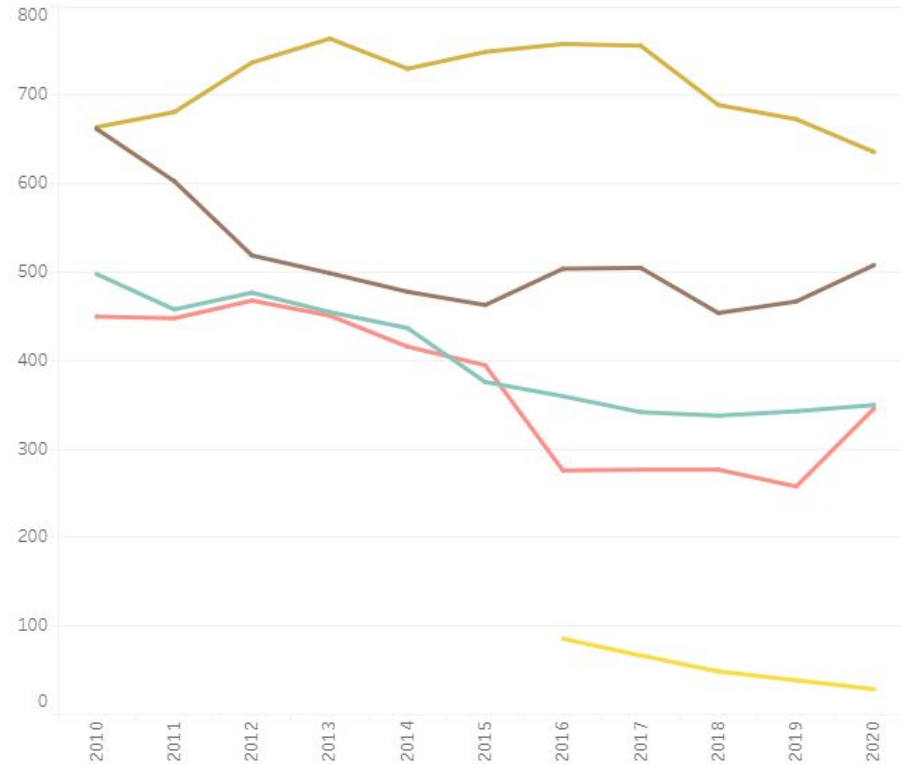


Cost of education

- Is the problem value vs financing?
- Financing via income repayment plans
- Decrease time to degree
 - BS in 3 Calendar years by including summer
 - 3+1 BS/MS programs
- More gifts to financial aid
- Modest opportunities for cost cutting

Enrollment - Grad and Professional

Enrollment by Year per Selected Demographics



SELECT DEMOGRAPHIC CATEGORY HERE

College

Selected Demographic

- Arts & Sciences
- Business
- Education
- Engineering & Applied Science
- Intercollegiate Programs

Select Table Metric

Headcount

Demographics by Year

Selected Demographic	2010	2011	2012	2013	2014
Arts & Sciences	497	457	476	454	436
Intercollegiate Programs					
Engineering & Applied Science	663	680	736	763	729
Business	449	447	467	450	415
Education	661	602	518	498	477
Grand Total	2,270	2,186	2,197	2,165	2,057



Priorities for graduate and professional programs

- Better data on students
- Improve recruiting/visibility
- More consistency in student programming and support
 - Career and professional development
 - Mental health



Priorities for graduate programs

Research Graduate Programs - Mostly PhD programs

- Preparation of students for independent research careers
- Not just academic careers
- Quality mentorship is a key
- In some disciplines students facilitate faculty research
- More research support is needed



What is meant by “Research Expenditures”?

Sources

- Mostly grants and contracts - federal state, local and corporate
- Internal operating funds, faculty startup money
- Philanthropy

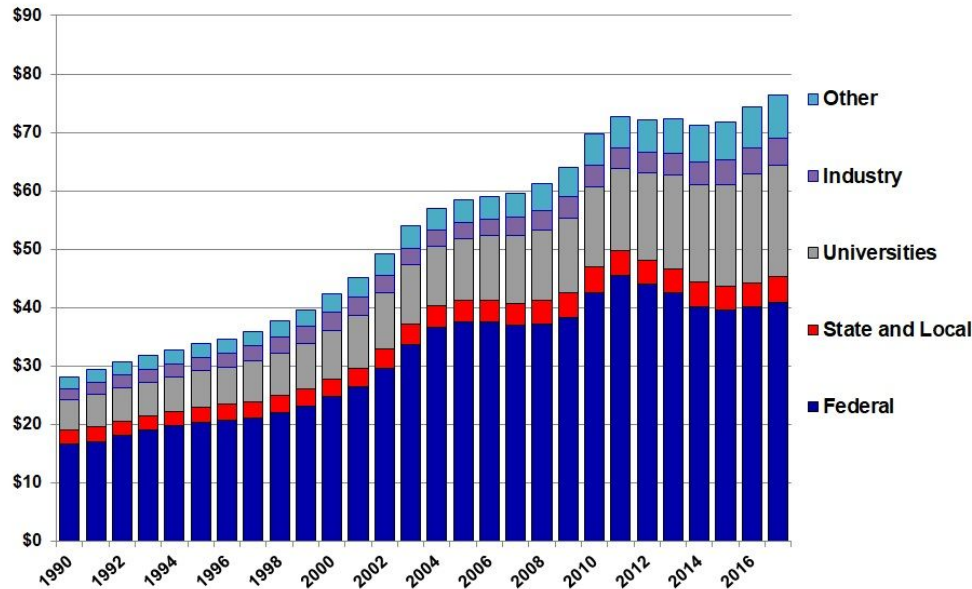
Uses

- Research staffing (students, postdocs, technicians)
- Equipment
- Supplies
- Indirect costs (facilities and administration - about 60% of direct costs)

University research expenditures in US

University R&D Funding by Source

expenditures in billions, FY 2018 dollars



Source: NSF, National Center for Science and Engineering Statistics, *Higher Education R&D* series, based on national survey data. Includes Recovery Act funding. © 2018 AAAS



What is needed to grow research?

Investments in people and facilities

- HST Building
- Investments in research active faculty
- Seed funding and early stage support

All of these are expensive

A goal is to capture more federal funding

- Infrastructure/energy
- Health esp. vaccines and public health
- Technology (Chuck Schumer - National Science and Technology Foundation?)
- Education (post-pandemic)
- Other areas?



Revenue growth strategies

- Undergraduate enrollment
 - College of Health
 - Enhance yield with distinctive programs
- Graduate/professional programs
 - Programmatic innovation (disciplines and credentials)
 - Better marketing/visibility
 - Online/Hybrid
- Philanthropy/Fundraising
- Expand research
 - College of Health
 - Targeted areas

Revenue 2011-2020 (annual increases)

		FY 11-12	FY 12-13	FY 13-14	FY 14-15	FY 15-16	FY 16-17	FY 17-18	FY 18-19	FY 19-20	Delta 2010-19
Tuition and fees, net	\$152,070	4.1%	4.7%	4.8%	3.6%	3.1%	3.1%	3.0%	-0.3%	5.8%	29%
Contributions	\$11,982	-10.4%	24.5%	24.5%	-27.1%	24.3%	-19.4%	33.6%	-11.9%	-16.8%	20%
Investment return	\$68,083	2.6%	1.2%	4.2%	5.8%	5.9%	1.2%	3.4%	5.3%	-1.6%	34%
Auxiliary enterprises	\$37,769	2.5%	3.3%	2.2%	2.9%	3.4%	-1.3%	0.7%	2.9%	-20.7%	18%
Independent operations	\$19,071	-19.9%	-37.6%	10.6%	-4.2%	10.3%	37.6%	43.6%	-47.9%	-26.2%	-40%
Other sources	\$8,197	9.0%	4.2%	1.6%	7.3%	-5.9%	6.5%	-2.3%	-1.0%	-8.3%	20%
Federal grants and contracts	\$28,080	14.4%	5.5%	-15.5%	-5.5%	-12.9%	16.3%	2.4%	1.9%	12.4%	2%
State and local grants and contracts	\$9,772	-24.7%	-3.1%	1.7%	0.0%	-13.0%	1.0%	13.1%	4.3%	-2.6%	-23%
Private grants and contracts	\$8,254	-13.4%	11.7%	-19.5%	-6.3%	-3.6%	26.7%	-16.0%	-15.5%	-15.7%	-37%
Total Grants and Contracts	\$46,106	1.1%	5.1%	-13.6%	-4.6%	-11.5%	15.3%	0.8%	-0.2%	6.1%	-10%
Total support and revenues	\$297,172	1.5%	2.6%	2.7%	1.5%	2.8%	3.5%	5.0%	-1.8%	-0.7%	18%



A Lehigh undergraduate education should...

Prepare students for a knowledge and relationship-based economy

- Exploit and expand experiential learning programs and access (Mountaintop, entrepreneurship, study abroad, research, arts programs)
- Be personalized - Designed around the goals of each student
 - Customized/bespoke with strong mentoring and advising
 - Rigorous and challenging with connection to the real world
- Be accessible and inclusive

The quality of the education needs to drive students' choice of Lehigh



Themes for the Lehigh undergraduate education

Rigor and ROI - “Theory to Practice to Expertise”

Personalized and inclusive - “Designed for You”

*Technology and our experience in remote learning can enhance/accelerate these



Lehigh grad and professional education should...

- Have online and/or hybrid options
- Be modular and stackable - including certificates and other credentials
- Be nimble - responsive to the market
- Provide clear ROI
- Increase rankings and visibility

This is especially true for tuition generating programs - rather than PhD programs



Lehigh research must be....

- Larger - goal should be to at least double external funding
- More visible/better known
 - What are our most compelling success stories?
 - How are we addressing the biggest challenges?
- Targeted around areas of strength with high opportunity such as:
 - Health Technology and Data
 - Smart Green Infrastructure
- More strategic and professionalized



Investments to transform Lehigh

Investments that focus on students

- Leverage success in experiential learning to update and innovate our academic programs
- Modernize approach to student advising across the university using technology and people
- Enhance key online courses and programs to increase flexibility and grow professional programs

Invest in critical academic areas

- Grow the College of Health and health science and technology area to critical mass ASAP
- Enhance educational and research programs related to data science/computation
- Connect to national conversation about research priorities



Comments/Discussion

- “Make no little plans. They do not have magic...to stir souls.” -Daniel Burnham



Metrics

- Enrollments
- Persistence and graduation rates
- Diversity
- Rankings
- Research funding and productivity



Other needles to move

- Faculty leadership development
- Enhance innovation for research and academic programs
 - Idea generation
 - Incubation
 - Scaling/stabilization
 - Tech transfer



USNWR Ranking Components

RANKING FACTOR

GRADUATION AND RETENTION RATES

SOCIAL MOBILITY

GRADUATION RATE PERFORMANCE

UNDERGRADUATE ACADEMIC REPUTATION

FACULTY RESOURCES FOR 2019-2020 ACADEMIC YEAR

STUDENT SELECTIVITY FOR THE FALL 2019 ENTERING CLASS

FINANCIAL RESOURCES PER STUDENT

AVERAGE ALUMNI GIVING RATE

GRADUATE INDEBTEDNESS

TOTAL

INDICATOR WEIGHT

22%

5%

8%

20%

20%

7%

10%

3%

5%

100%



WSJ THE rankings

Resources (30%)

Does the college have the capacity to effectively deliver teaching? The Resources area represents 30 per cent of the overall ranking. Within this we look at:

- Finance per student (11%)
- Faculty per student (11%)
- Research papers per faculty (8%)
-

Engagement (20%)

Does the college effectively engage with its students? Most of the data in this area are gathered through the *THE* US Student Survey. The Engagement area represents 20 per cent of the overall ranking. Within this we look at:

- Student engagement (7%)
- Student recommendation (6%)
- Interaction with teachers and students (4%)
- Number of accredited programmes (3%)

Outcomes (40%)

Does the college generate good and appropriate outputs? Does it add value to the students who attend? The Outcomes area represents 40 per cent of the overall ranking. Within this we look at:

- Graduation rate (11%)
- Value added to graduate salary (12%)
- Debt after graduation (7%)
- Academic reputation (10%)
-

Environment (10%)

Is the college providing a good learning environment for all students? Does it make efforts to attract a diverse student body and faculty? The Environment area represents 10 per cent of the overall ranking. Within this we look at:

- Proportion of international students (2%)
- Student diversity (3%)
- Student inclusion (2%)
- Staff diversity (3%)

		RANK					
RANK	COLLEGE	OUTCOMES	RESOURCES	ENGAGEMENT	ENVIRONMENT	AVERAGE NET PRICE	
▲▼	▲▼	▲▼	▲▼	▲▼	▲▼	▲▼	
51	University of Virginia (Main campus)	26	190	312	380	\$17,845	
52	Barnard College	58	87	201	141	\$26,681	
53	University of Miami	71	89	73	63	\$43,305	
54	Mount Holyoke College	77	52	337	120	\$29,737	
55	Boston College	40	131	>400	358	\$26,567	
56	University of Florida	29	332	48	231	\$11,313	
56	Hamilton College	61	52	>400	344	\$27,809	
58	Lehigh University	83	30	257	304	\$26,782	
59	Davidson College	59	59	>400	395	\$26,565	
59	University of Richmond	81	37	120	250	\$24,624	

Change in Enrollment Institutional Sector: 2016 to 2020

