



ELSEVIER

Research Intelligence Tools for Building Partnerships, Narratives, and Enterprises at HBCUs

Daniel Calto, Elsevier

Arthur Ellis, Elsevier

Sherine Obare, North Carolina A&T State University and
University of North Carolina at Greensboro



Issues in Research & Publishing Facing HBCUs

- **Time**
 - Workload is heavy with teaching
 - Significant service requirements
 - Limited support to assist with teaching responsibilities
- **Infrastructure**
 - Research staff to support faculty
 - Access to state-of-the-art facilities
 - Doctoral students & Postdoctoral fellows
- **Reviewers**
 - Bias in reviewers
 - Type of research

Efforts to Promote Inclusivity in Publishing and Scholarly Communications



The Researcher Jo Through a Gender



An examination of research progression and perception

% Representation of Women on Lancet group International Advis

The Lancet	50%
The Lancet Child & Adolescent Health	64%
The Lancet Diabetes & Endocrinology	50%
The Lancet Digital Health	51%
The Lancet Gastroenterology & Hemopathology	55%
The Lancet Global Health	52%
The Lancet Haematology	59%
The Lancet Healthy Longevity	47%
The Lancet HIV	61%
The Lancet Infectious Diseases	57%
The Lancet Microbe	71%
The Lancet Neurology	42%

Overall aggregate across these journals: 53.2%

nature

[Explore content](#) [About the journal](#) [Publish with us](#) [Subscribe](#)

[nature](#) > [news feature](#) > [article](#)

NEWS FEATURE | 23 February 2022 | Correction [28 February 2022](#)

The giant plan to track diversity in research journals

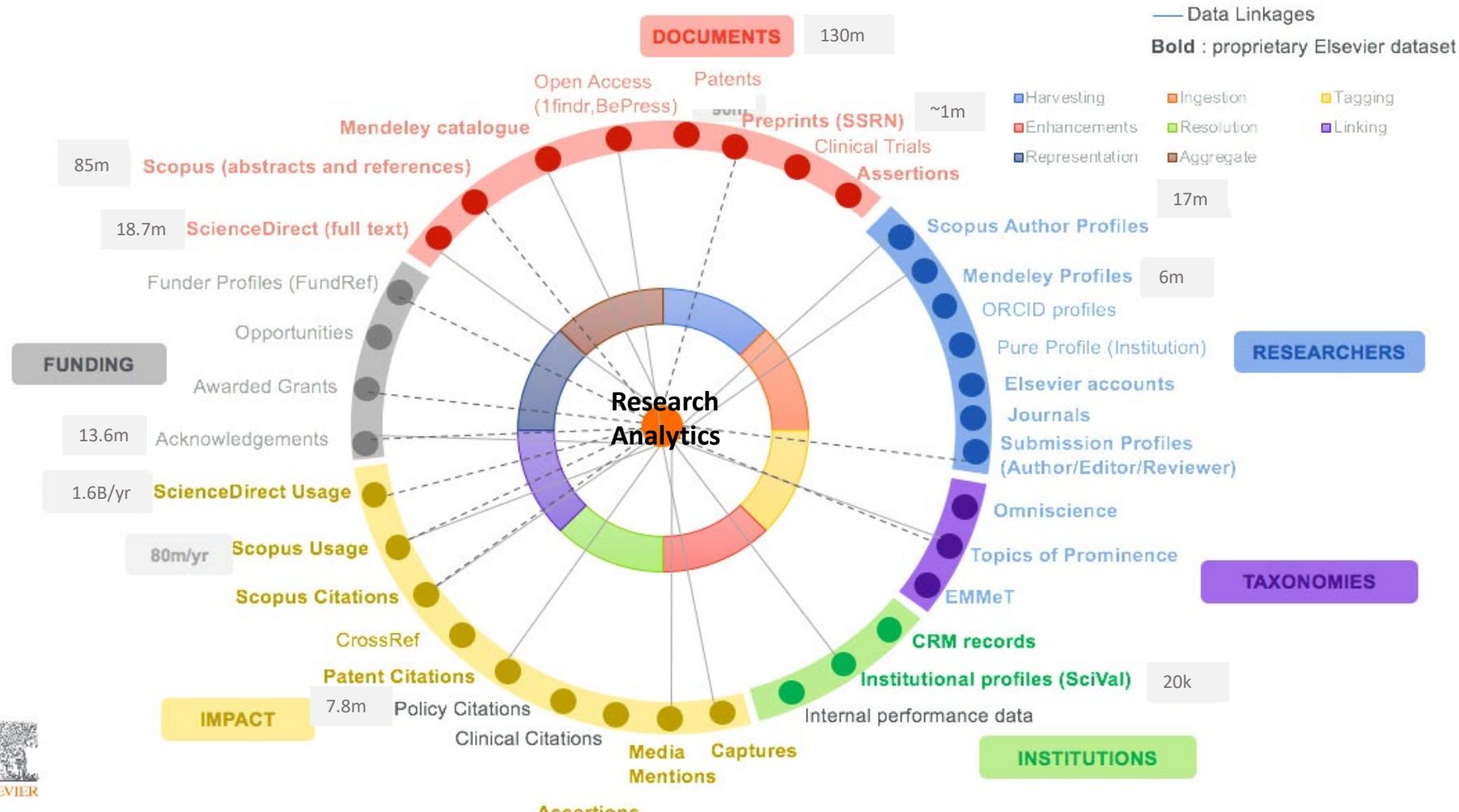
Efforts to chart and reduce bias in scholarly publishing will ask authors, reviewers and editors to disclose their race or ethnicity.

The Lancet Regional Health – Americas	50%
The Lancet Regional Health – Europe	50%
The Lancet Regional Health – Western Pacific	54%
eBioMedicine – part of The Lancet Discovery Science	53%
eClinicalMedicine – part of The Lancet Discovery Science	56%

Elsevier's Linked Data and Analytics

- 85M peer-reviewed papers and conference proceedings from 7,000 publishers
- 253K books and 2.13M book items, focused on social sciences content
- 17M author profiles—academia, industry, government
- 80,000 affiliation profiles of research-producing institutions worldwide
- 1.7B cited references
- 130M patent records from 100+ patent offices worldwide
- Expertise in machine learning, semantic analysis, scientific taxonomies
- World's largest publisher

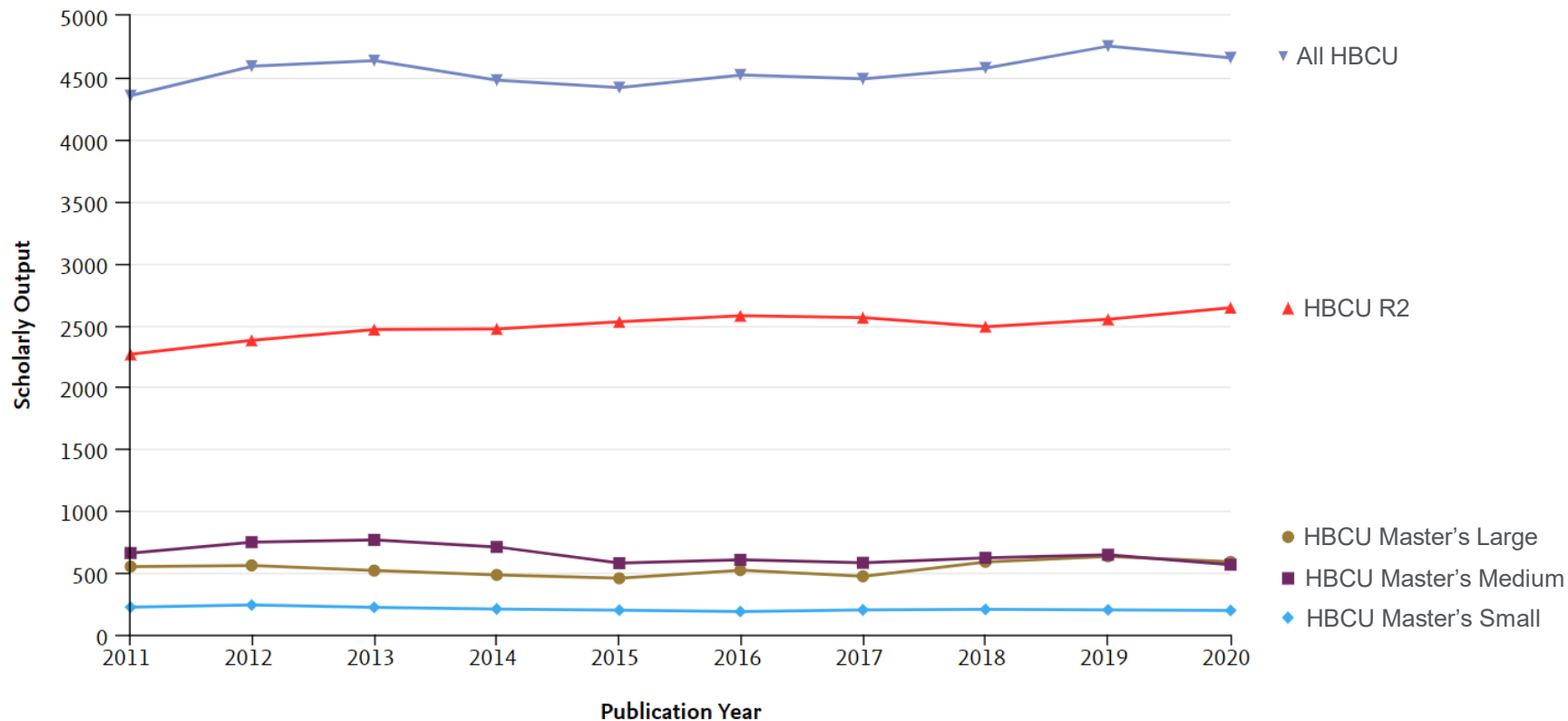
Linked data and analytics for professionals across academia, industry, and govt.





Overview of Research and Collaboration at HBCUs

HBCU Research Output, 2011 – 2020

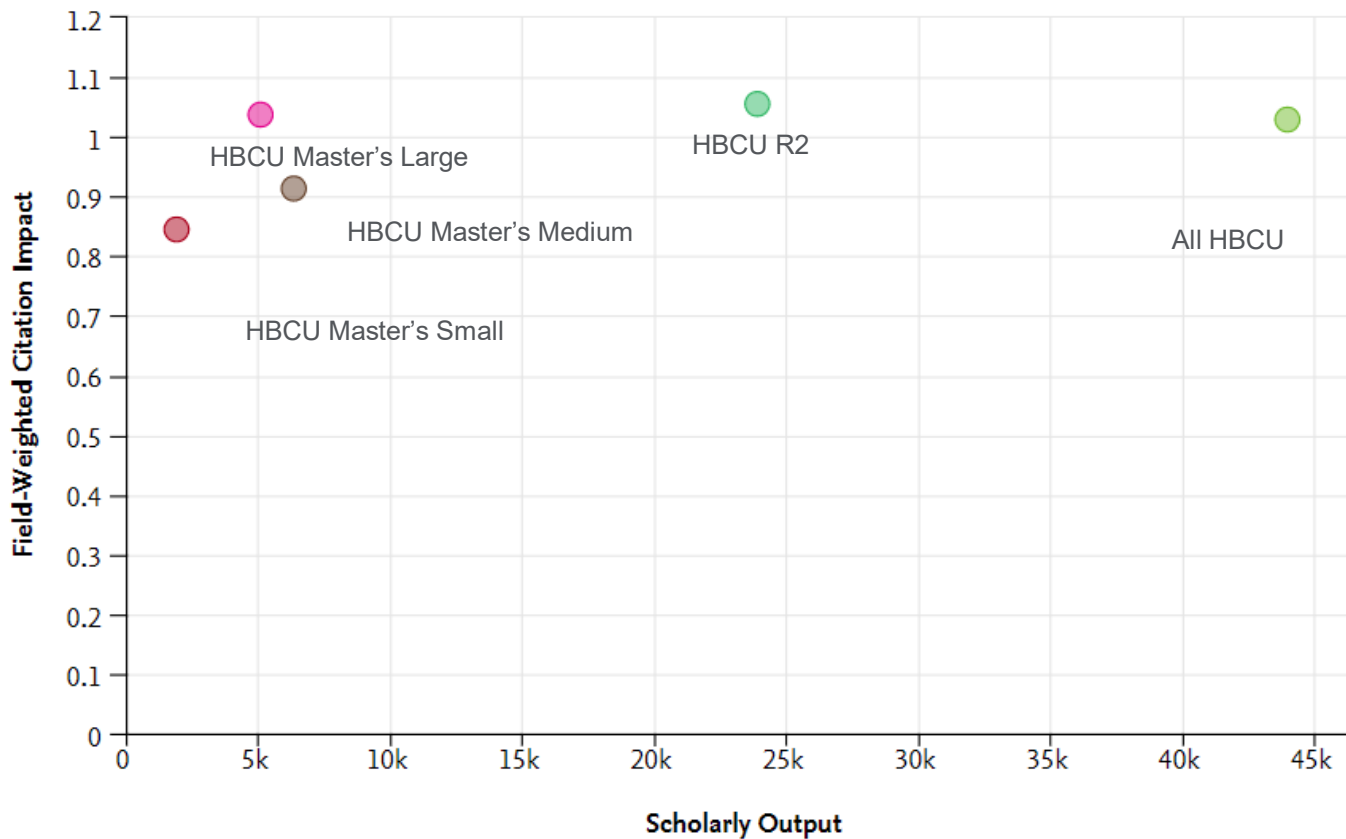


HBCU Research Output and Impact, 2011 – 2020



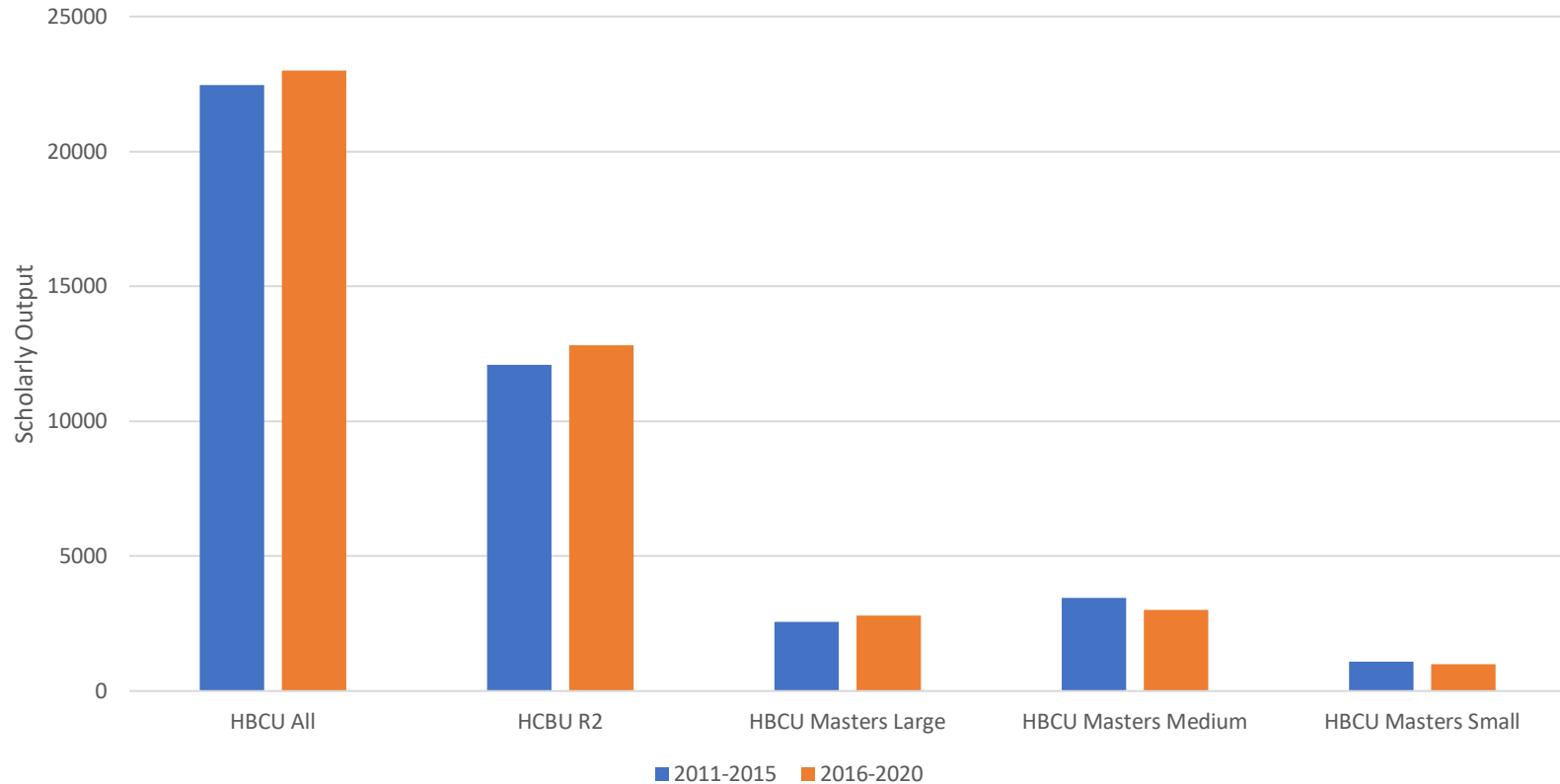
All publications, not filtered for author count

HBCU Research Output and Impact, 2011 – 2020



HBCU Research Output, 2011 – 2020

Five Year Comparisons



Top Non-HBCU Academic Collaborators, 2016 – 2020



Institution	Country/Region	Co-Authored Publications	Field-Weighted Citation Impact
Florida State University	United States	1168	1.33
Vanderbilt University	United States	614	1.62
Harvard University	United States	489	2.69
Johns Hopkins University	United States	415	2.38
Texas A&M University	United States	405	1.70
Emory University	United States	377	1.23
University of Arkansas System	United States	322	1.34
University of Florida	United States	305	1.62
King Abdulaziz University	Saudi Arabia	289	2.41
University of North Carolina at Chapel Hill	United States	285	1.76
Tshwane University of Technology	South Africa	272	2.70
Duke University	United States	265	1.49
University of Maryland, College Park	United States	255	1.92
University of Mississippi	United States	231	1.14

Top HBCU vs. US Country Collaborators, 2016 – 2020



Countries/Regions	Scholarly Output ↓	Field-Weighted Citation Impact ∨	Countries/Regions	Scholarly Output ↓
1. China	3,614	1.51	China	285,040
2. India	1,299	1.20	United Kingdom	168,604
3. United Kingdom	953	2.51	Germany	132,020
4. Canada	914	2.41	Canada	130,263
5. South Korea	718	1.56	France	86,765
6. Germany	717	2.52	Australia	82,132
7. Saudi Arabia	671	2.19	Italy	80,870
8. France	644	2.32	Japan	63,859
9. South Africa	586	2.27	Spain	59,456
10. Turkey	551	1.88	Netherlands	58,044
			South Korea	55,006
			Switzerland	53,994
			Brazil	48,477
			India	46,754

Top HBCU Corporate Collaborators, 2016 – 2020

Institution	Scholarly Output ↓	Field-Weighted Citation Impact ✓
1.  Science Systems and Applications, Inc.	75	3.43
2.  GATS, Inc.	21	0.70
3.  Leidos Inc	19	1.88
4.  ICF International	14	0.81
5.  Brimrose Corporation of America	13	0.57
6.  Intel	10	0.59
7.  Alphabet Inc.	9	2.80
8.  Battelle	9	0.56
9.  Pfizer	9	1.68
10.  IBM	8	0.90

United States Collaboration Type Analysis, 2011 – 2020

Collaboration ^①

Scholarly Output in the United States, by amount of international, national and institutional collaboration



Metric		Scholarly Output	Field-Weighted Citation Impact
International collaboration	32.0%	2,192,227	1.83
Only national collaboration	26.2%	1,792,477	1.48
Only institutional collaboration	25.2%	1,724,254	1.26
Single authorship (no collaboration)	16.6%	1,140,621	0.84

Academic-Corporate Collaboration ^①

Scholarly Output in the United States with both academic and corporate author affiliations



Metric		Scholarly Output	Field-Weighted Citation Impact
Academic-corporate collaboration	4.7%	321,207	2.52
No academic-corporate collaboration	95.3%	6,528,372	1.38

HBCU Collaboration Type Analysis, 2011 – 2020

Collaboration ⓘ

Scholarly Output in HBCU 2011-2020 <100, by amount of international, national and institutional collaboration



Metric		Scholarly Output	Field-Weighted Citation Impact
■ International collaboration	29.6%	12,995	1.42
■ Only national collaboration	43.1%	18,946	1.02
■ Only institutional collaboration	15.6%	6,844	0.72
■ Single authorship (no collaboration)	11.8%	5,169	0.52

Academic-Corporate Collaboration ⓘ

Scholarly Output in HBCU 2011-2020 <100 with both academic and corporate author affiliations



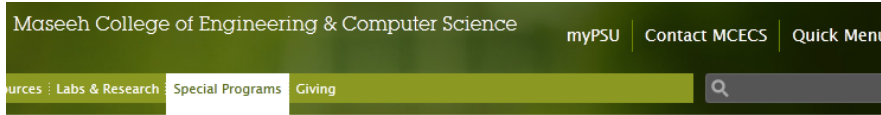
Metric		Scholarly Output	Field-Weighted Citation Impact
■ Academic-corporate collaboration	2.8%	1,247	2.19
■ No academic-corporate collaboration	97.2%	42,707	1.00

The Problem—How to Characterize and Understand Complex Relationships in Order to Maximize Mutual Benefits?



- Largest University in Oregon (30,000 students), urban campus, diverse student body
- Largest employer in Portland, Fortune 500 company, strong global R&D presence
- Hundreds of individual contacts between professors and Intel scientists, largely created on an ad-hoc basis—“a plate of spaghetti”

The Payoff—Strengthening Programs of Mutual Benefit



PSU » MCECS » Special Programs » Intel Vietnam Scholars

Intel Vietnam Scholars

Intel Vietnam Scholars is a program sponsored by Intel Corporation that provides transfer engineering students from select Vietnamese universities the opportunity to complete a Bachelor of Science degree in [Electrical](#) or [Mechanical Engineering](#), or [Supply and Logistics Management](#) at Portland State University.

This program not only provides each student with an excellent education and international experience, but also prepares them for a career in Intel's semiconductor assembly and test facility in Ho Chi Minh City when they return home. Since 2009 73 students have participated in the program, joining Portland State's graduating classes of 2011, 2012 and 2014.



- Intel's largest and newest assembly and test facility is in Ho Chi Minh City Vietnam
- Worked with Portland State to create custom BA program for Vietnamese students, who will become facility managers in Vietnam on their return.
- Joint Portland location allowed for students to gain direct experience working with some of Intel's leading R&D researchers and management.
- Result: 75 managers in three graduating classes—last class in 2014
- Model for future university-industry programs.



Research at North Carolina A&T State University (2016-20)

NC A&T State University Research Performance



Overall research performance

1,869 ▲

Scholarly Output ⓘ

32.6% All Open Access

[View list of publications](#)

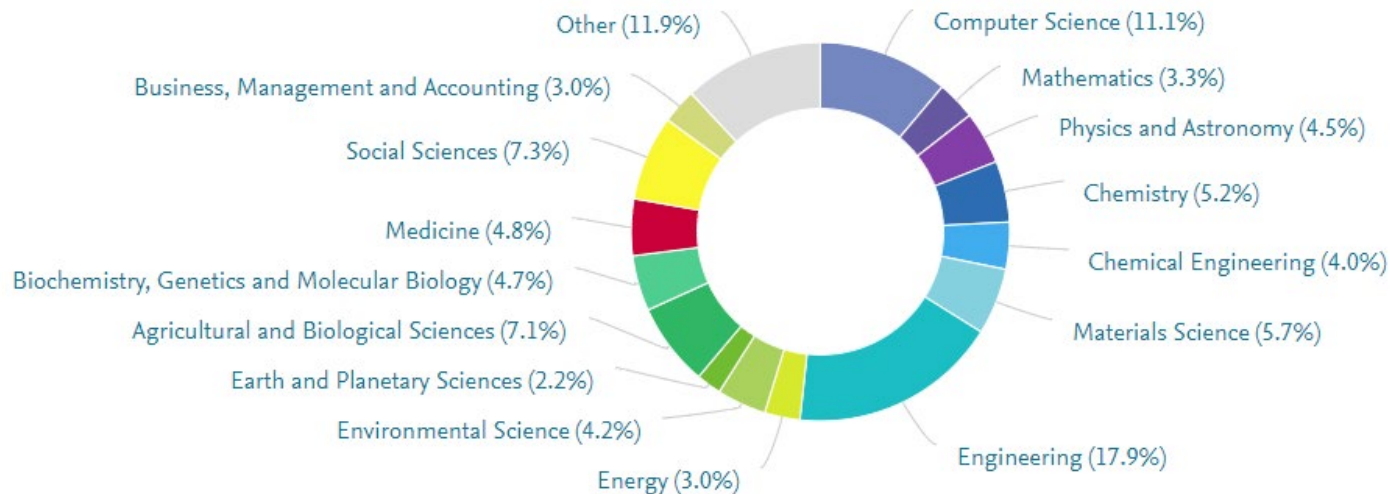
1,273 ▲

Authors

1.17

Field-Weighted Citation Impact ⓘ

Yearly breakdown



NC A&T State University Research Performance



Overall research performance

1,869 ▲

Scholarly Output ⓘ

32.6% All Open Access

[View list of publications](#)

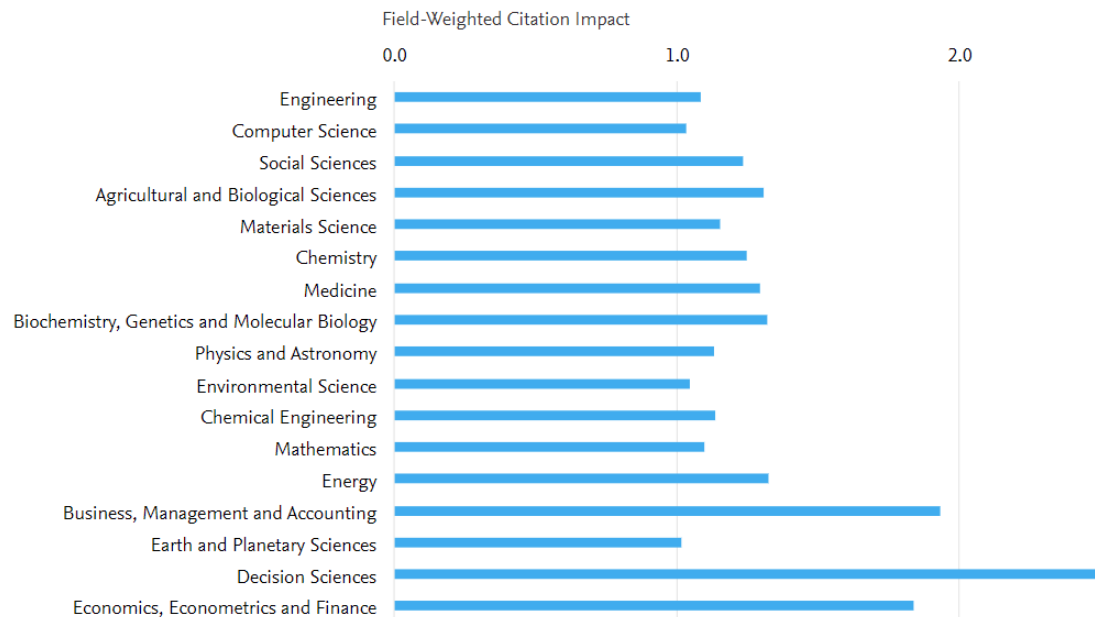
1,273 ▲

Authors

1.17

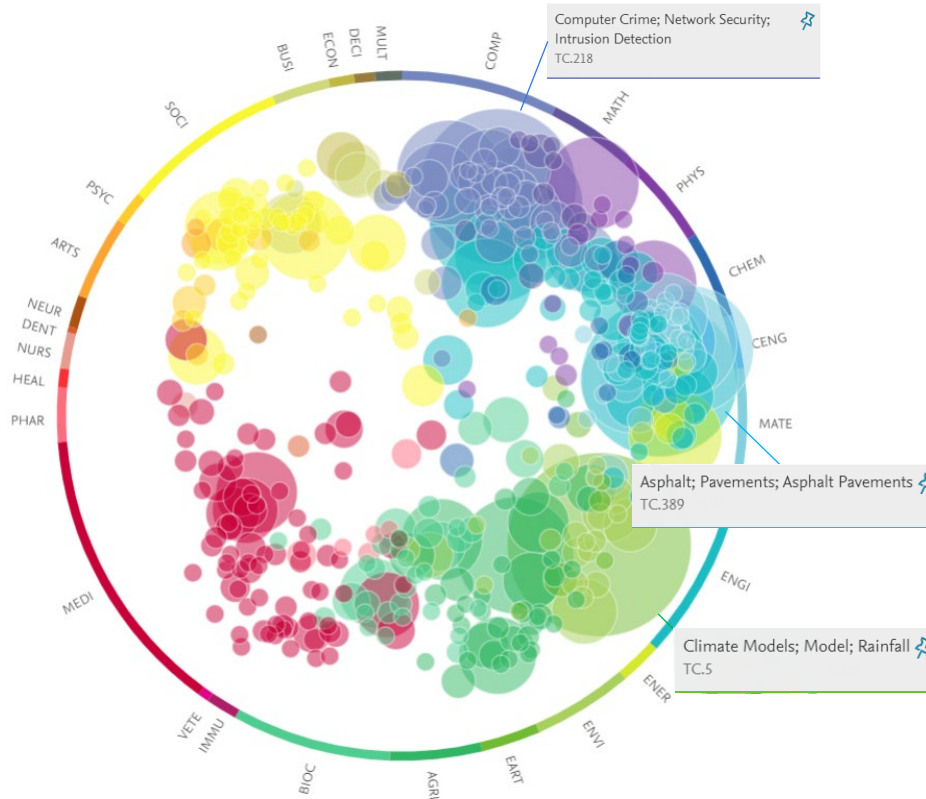
Field-Weighted Citation Impact ⓘ

[Yearly breakdown](#)



NC A&T State Topic Cluster Analysis

NCAT Topic Cluster Wheel



NCAT Top Topic Clusters by Output

Topic Cluster	Scholarly Output ↓	Field-Weighted Citation Impact
Climate Models; Model; Rainfall TC.5	43	1.01
Computer Crime; Network Security; Intrusion Detection TC.218	36	1.87
Asphalt; Pavements; Asphalt Pavements TC.389	36	2.00
Magnesium Alloys; Alloys; Aluminum Alloys TC.106	29	0.94
Breads; Starch; Glutens TC.169	26	1.29
Algorithms; Computer Vision; Models TC.0	26	1.55
Supply Chains; Supply Chain Management; Industry TC.146	25	4.71
Secondary Batteries; Electric Batteries; Lithium Alloys TC.30	24	1.10
Electrospinning; Nanofibers; Spinning (Fibers) TC.834	23	1.61
Semantics; Models; Recommender Systems TC.37	23	1.25

NC A&T State University Top Collaborators

Institution	Co-authored publications ↓	Co-authors at North Carolina A&T State University	Co-authors at the other institution	Field-Weighted Citation Impact ∨
 North Carolina State University	69 ▲	86 ▲	78 ▲	0.83
 University of North Carolina at Greensboro	47 ▼	65 ▲	60 ▼	1.11
 Arizona State University	37 ▲	44 ▲	25 ▲	1.98
 University of North Carolina at Chapel Hill	37 ▲	56 ▲	68 ▼	1.00
 Virginia Polytechnic Institute and State University	33 ▼	36	44	1.20
 Duke University	24 ▲	33 ▲	42 ▲	1.58
 Winston-Salem State University	22 ▼	37 ▼	28 ▼	0.81
 Old Dominion University	21 ▲	16 ▲	20 ▲	1.85
 University of Virginia	21 ▲	23 ▲	44 ▲	1.37
 Texas A&M University	19 ▲	20 ▼	15 ▲	0.84

Note: Filtered for publications with ≤ 100 authors

North Carolina A&T State University and University of North Carolina at Greensboro Collaboration Analysis



University of North Carolina at
Greensboro

Co-authored North Carolina A&T State University

👤 60 ▾
co-authors with North Carolina A&T State University

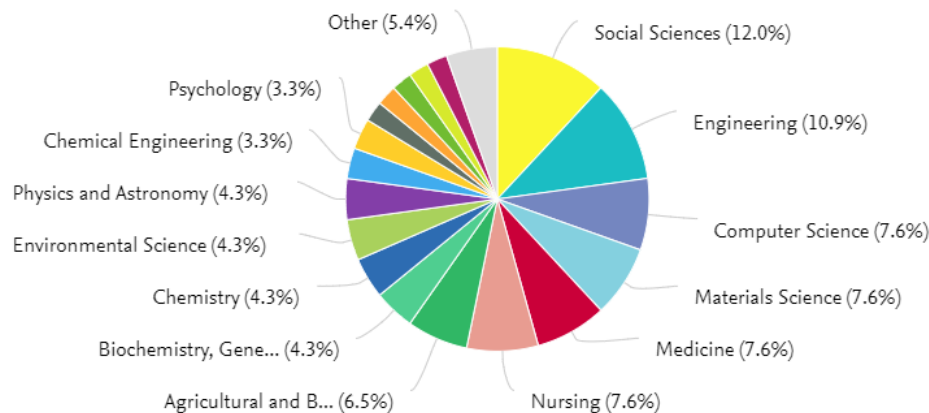
📄 47 ▾
publications

👤 65 ▲
co-authors with the University of North Carolina at
Greensboro

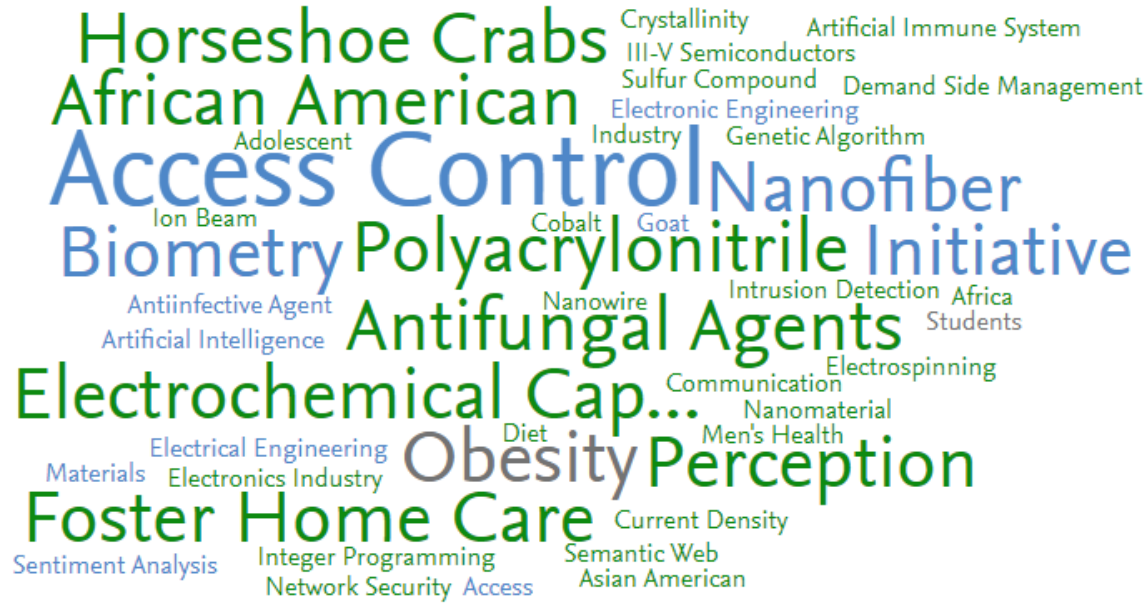
1.35
⚙️ Field-Weighted Citation Impact

1.11
⚙️ Field-Weighted Citation Impact

1.14
⚙️ Field-Weighted Citation Impact



Collaboration Keyphrase Analysis: North Carolina A&T State University and University of North Carolina at Greensboro



A A A relevance of keyphrase | declining A A A growing (2016-2020)

NC A&T State University Top International Collaborators



Institution	Co-authored publications ↓	Co-authors at North Carolina A&T State University	Co-authors at the other institution	Field-Weighted Citation Impact ✓
Massey University	13 ▲	4 ▲	10 ▲	2.28
Huazhong Agricultural University	11	1	20 ▼	1.93
Nanjing Normal University	11 ▲	9 ▲	13 ▲	1.21
A. Alikhanian Yerevan Institute of Physics	10 ▲	14 ▲	13	1.78
National Research Center	10 ▲	5 ▲	12 ▲	3.18
Xi'an Jiaotong University	10 ▼	9 ▼	21 ▼	0.95
Gorgan University of Agricultural Sciences and Natural Resources	9 ▲	4 ▲	4 ▲	2.00
Ministry of Education, China	9 ▼	13 ▼	31 ▼	1.35
Qatar University	8 ▼	9 ▼	5 ▼	2.42
Universidad Autonoma del Estado de Mexico	8 ▲	1 ▲	16 ▲	1.28

Note: Filtered for publications with ≤ 100 authors

NC A&T State University Top Corporate Collaborators



Institution	Co-authored publications ↓	Co-authors at North Carolina A&T State University	Co-authors at the other institution	Field-Weighted Citation Impact ✓
Intel	4	8 ▼	4	1.23
United Technologies Corporation	3 ▲	8 ▲	1 ▲	0.70
ABB Group	2 ▲	4 ▲	1 ▲	1.25
Bruker Corporation	2 ▼	3 ▼	2 ▼	1.66
Dentsply Sirona	2	3	2	0.00
General Motors	2 ▼	4 ▼	2 ▼	0.73
IHRC, Inc.	2 ▼	1 ▼	1 ▼	1.92
Mitsubishi Electric Research USA	2	1	4	1.03
PepsiCo	2 ▲	3 ▲	1 ▲	1.21
Tofwerk AG	2	3	1	2.99

Note: Filtered for publications with ≤ 100 authors



SDG-Related Research at HBCUs

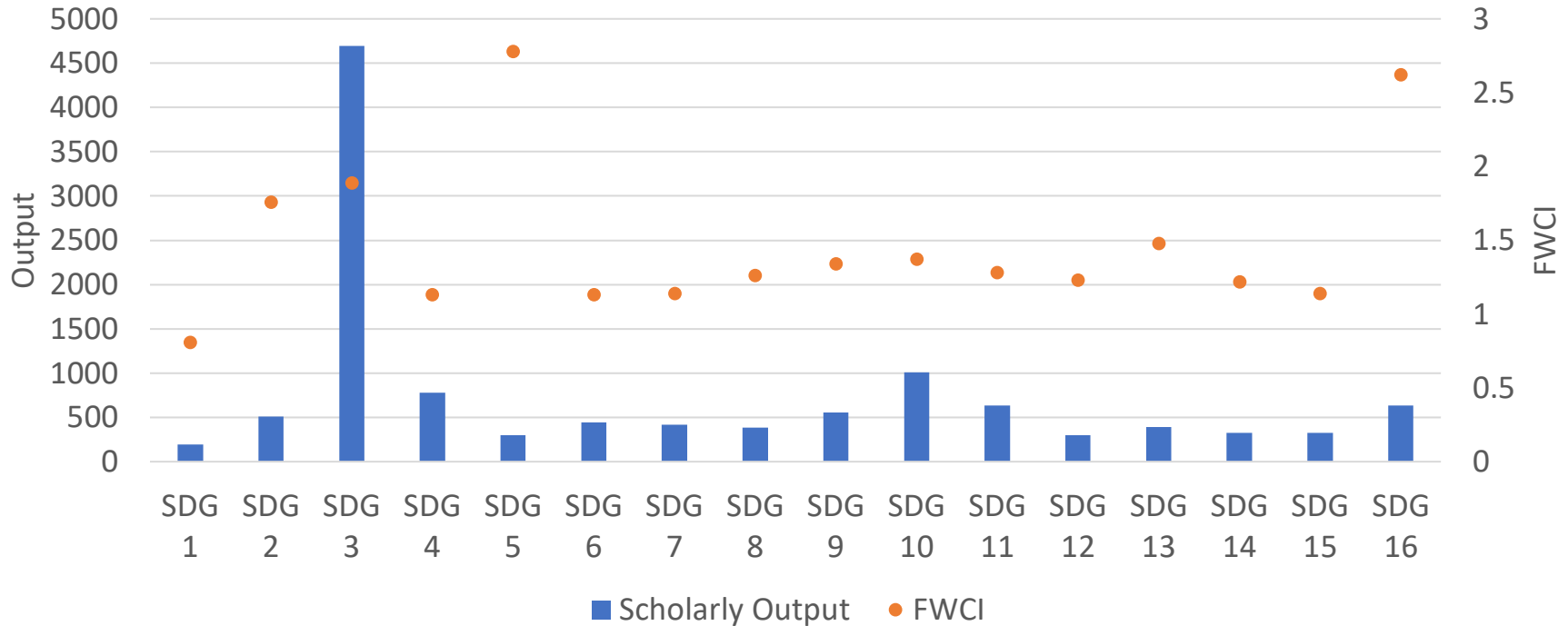
HBCUs, US: SDG Research Output and Impact



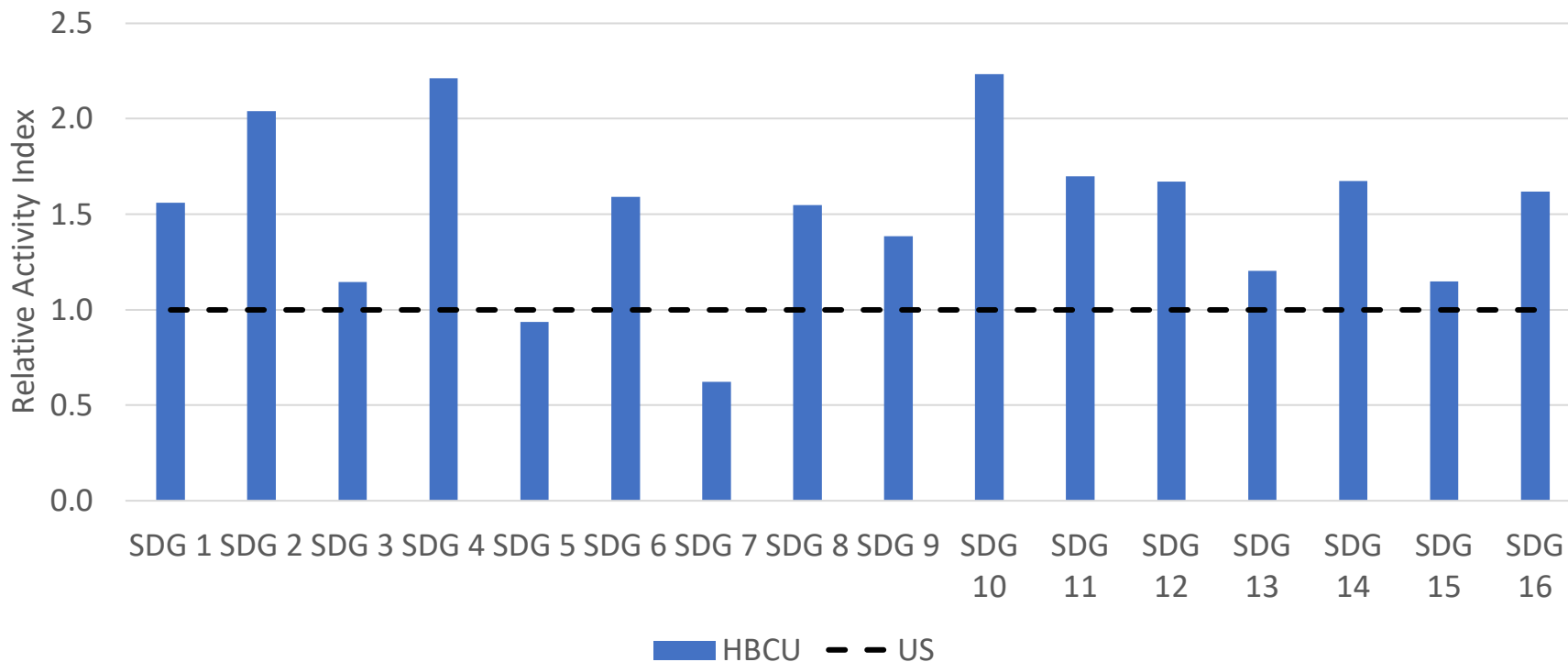
	HBCUs			United States		
	Scholarly Output	Share of All HBCU Output	FWCI	Scholarly Output	Share of all US output	FWCI
SDG 1	191	0.8%	0.81	18556	0.5%	1.37
SDG 2	512	2.2%	1.76	38042	1.1%	1.57
SDG 3	4693	20.3%	1.89	620241	17.7%	1.68
SDG 4	779	3.4%	1.13	53344	1.5%	1.21
SDG 5	296	1.3%	2.78	47942	1.4%	1.34
SDG 6	445	1.9%	1.13	42337	1.2%	1.34
SDG 7	418	1.8%	1.14	101633	2.9%	1.94
SDG 8	383	1.7%	1.26	37492	1.1%	1.48
SDG 9	558	2.4%	1.34	61045	1.7%	1.26
SDG 10	1006	4.4%	1.37	68199	2.0%	1.43
SDG 11	632	2.7%	1.28	56361	1.6%	1.52
SDG 12	296	1.3%	1.23	26837	0.8%	1.32
SDG 13	389	1.7%	1.48	48936	1.4%	1.82
SDG 14	325	1.4%	1.22	29408	0.8%	1.43
SDG 15	328	1.4%	1.14	43310	1.2%	1.33
SDG 16	635	2.8%	2.62	59360	1.7%	1.27

* Please note that a significant proportion of Health Research falls within SDG 3 for many institutions. For this reason, the % for SDG 3 are significantly higher than that of any other SDG for all entities with a department of Health Sciences.

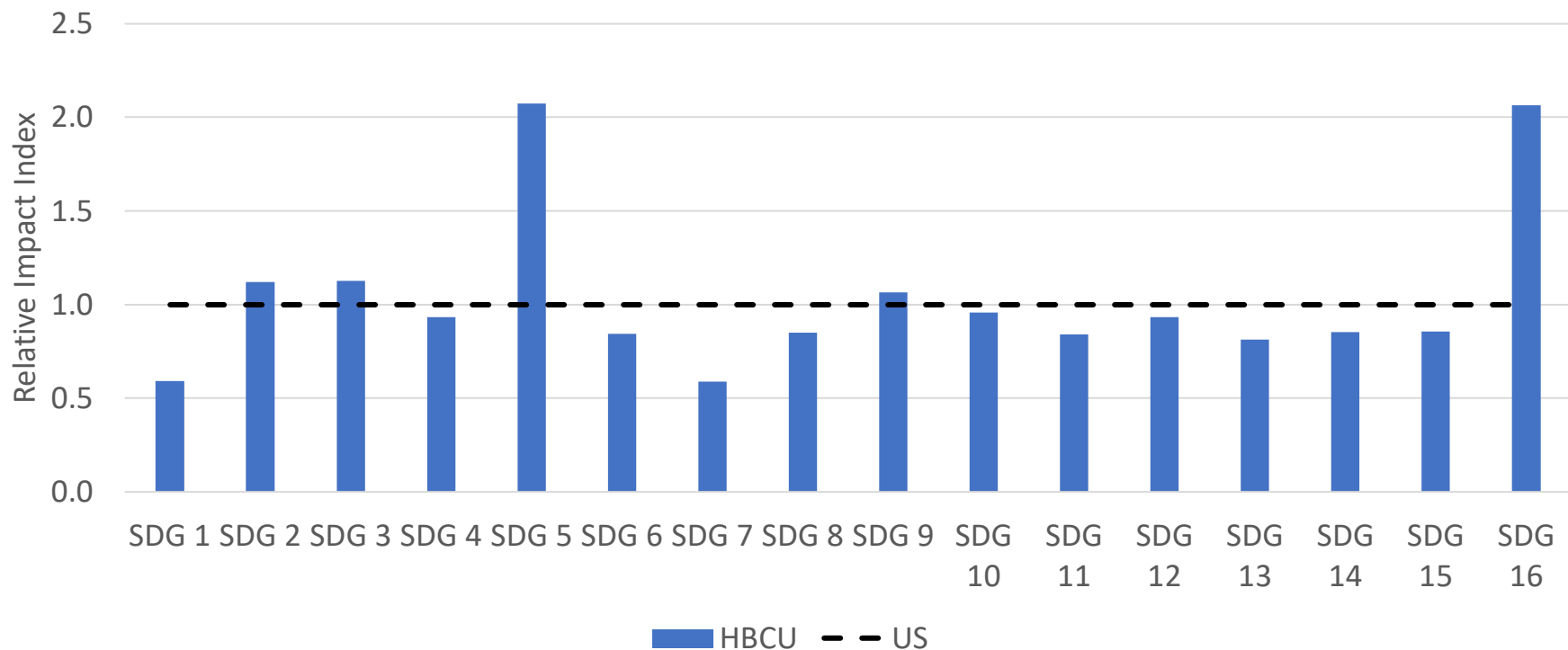
HBCU SDG-Related Research, Output and Impact




Benchmarking SDG Output as Share of Research



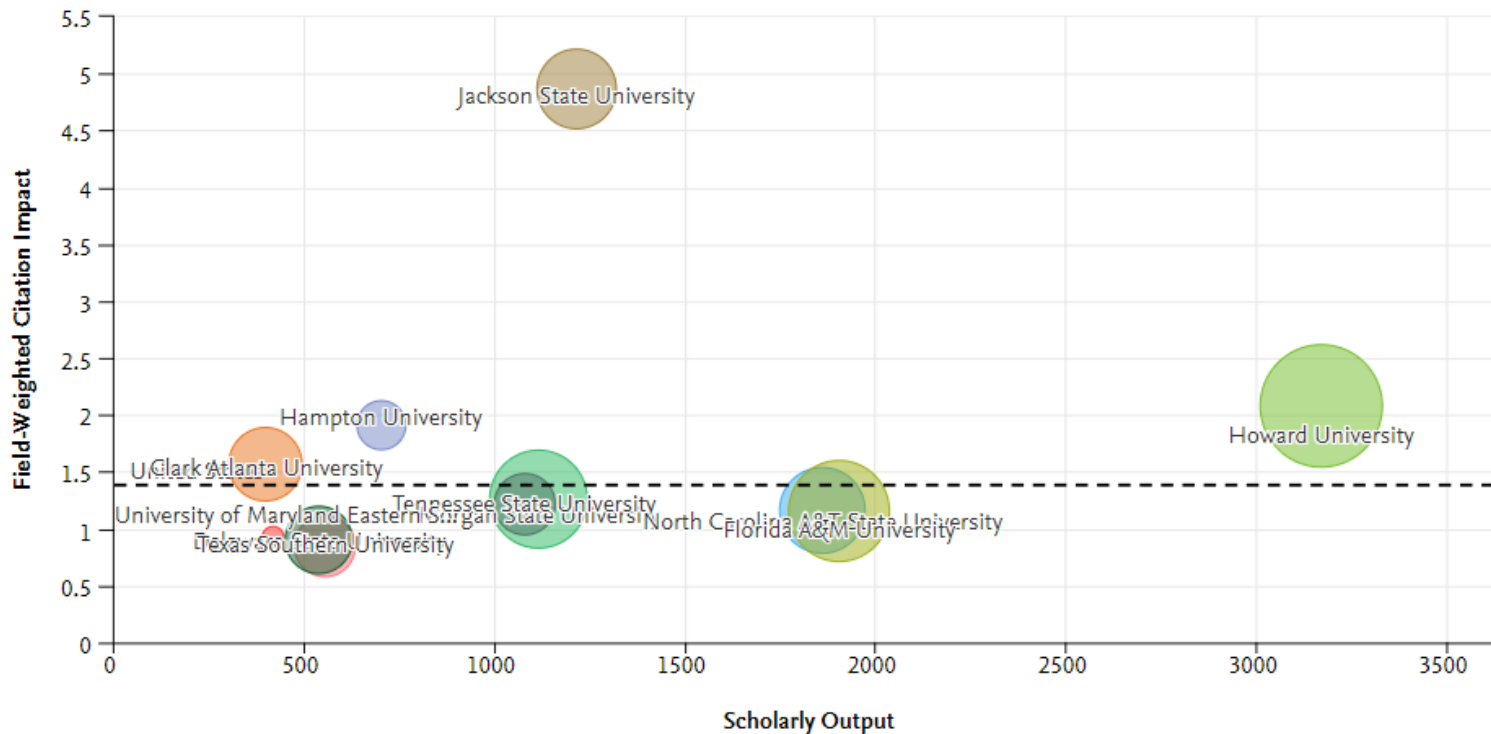
Benchmarking FWCI of SDG Output





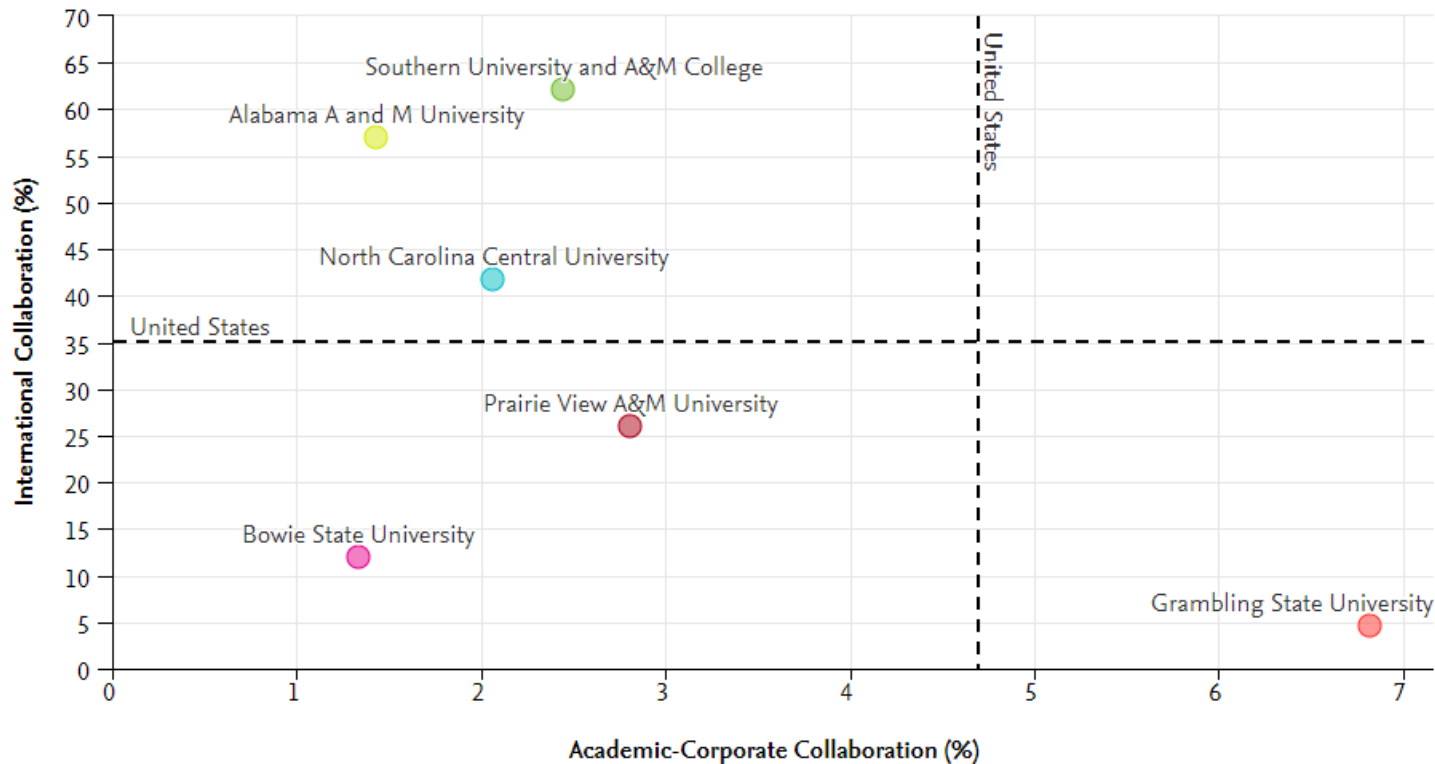
HBCU Analysis by 2018 Carnegie Classification

HBCU R2 Cohort: Output, Impact, Grants



Bubble size = volume of NIH & NSF grant award sums

HBCU Master's Programs (Larger): Collaboration

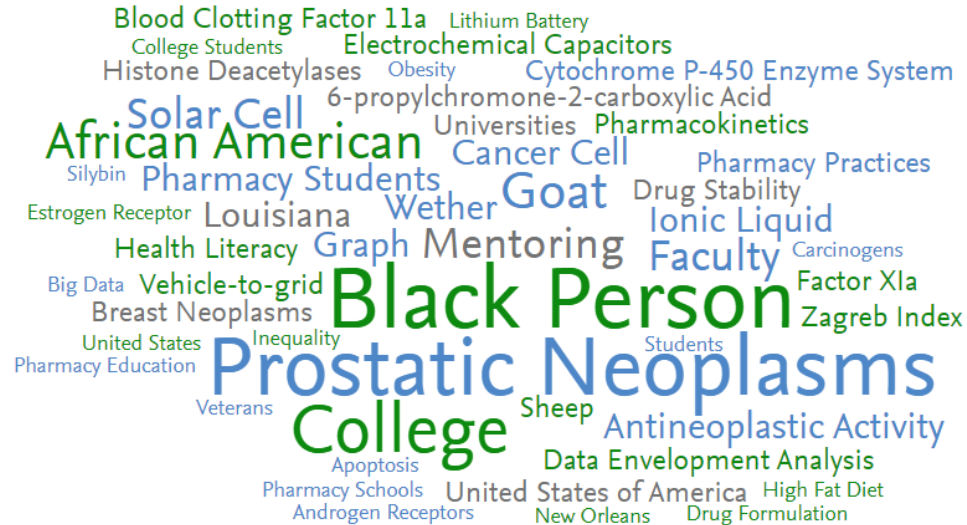
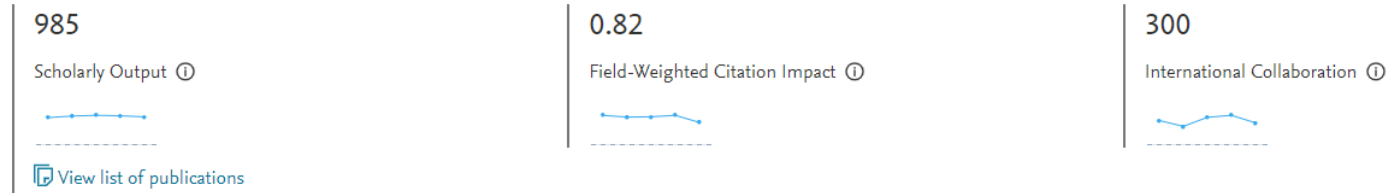


Top Corporate Collaborations with Master's (Medium) Cohort

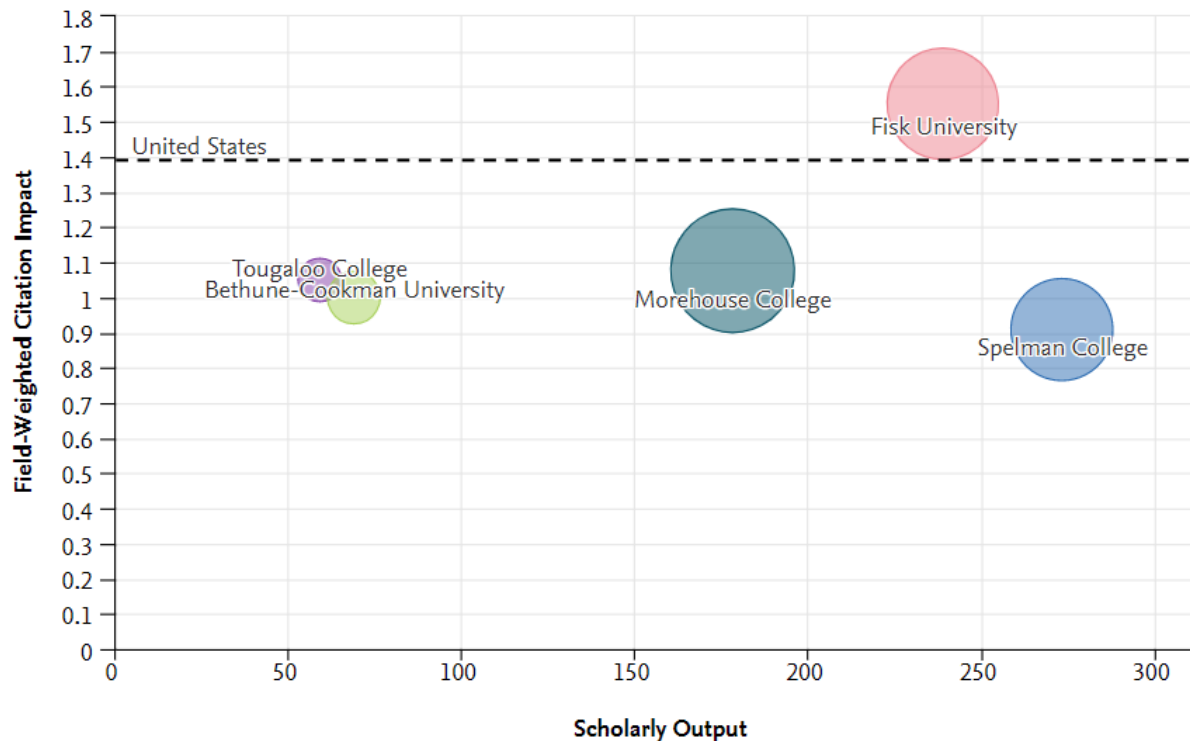
	<input type="checkbox"/>	Institution	Scholarly Output ↓	Field-Weighted Citation Impact ✓
1.	<input type="checkbox"/>	 Honeywell	4	1.26
2.	<input type="checkbox"/>	 Orange Labs	4	0.04
3.	<input type="checkbox"/>	 Leidos Inc	3	3.44
4.	<input type="checkbox"/>	 Northwest Institute for Nonferrous Metal Research	3	1.57
5.	<input type="checkbox"/>	 ABB Group	2	1.99
6.	<input type="checkbox"/>	 ADISS Lab Ltd.	2	0.11
7.	<input type="checkbox"/>	 China National Nuclear Corporation	2	0.62
8.	<input type="checkbox"/>	 Eli Lilly	2	1.85
9.	<input type="checkbox"/>	 GE Healthcare	2	0.84
10.	<input type="checkbox"/>	 Gilead Sciences, Inc.	2	1.01

Master's Programs Cohort (Small): Overview

Overall research performance



Baccalaureate Colleges*: Output, Impact, Funding



*Top five colleges by scholarly output

Bubble size = volume of NIH & NSF grant award sums

Summary

- Bibliometric data reveal that HBCUs can craft compelling narratives about their research enterprises, including linking them to the UN SDGs and to significant local and global issues.
- Growing the HBCU research enterprise requires overcoming major challenges so the time, staffing, infrastructure, and resources needed are provided to scholars; facilitating collaborations with academic institutions, industry, and international partners can raise the visibility and impact of published scholarly work by HBCU authors.
- The commitment of dozens of publishers to promote inclusiveness and diversity among authors, reviewers and editors and of initiatives like Elsevier's reports on gender in research and linkages of research to SDGs will support HBCUs in their efforts to enhance their research enterprise.



ELSEVIER

Thank You

Daniel Calto, D.Calto@Elsevier.com

Arthur Ellis, A.Ellis@Elsevier.com

Sherine Obare, soobare@ncat.edu

Thanks, also, to Ann Gabriel, Heather Luciano, and Jesse Mudrick

For interested students:

Elsevier's Rising TIDE summer internship program





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Please follow the QR code above for a brief survey

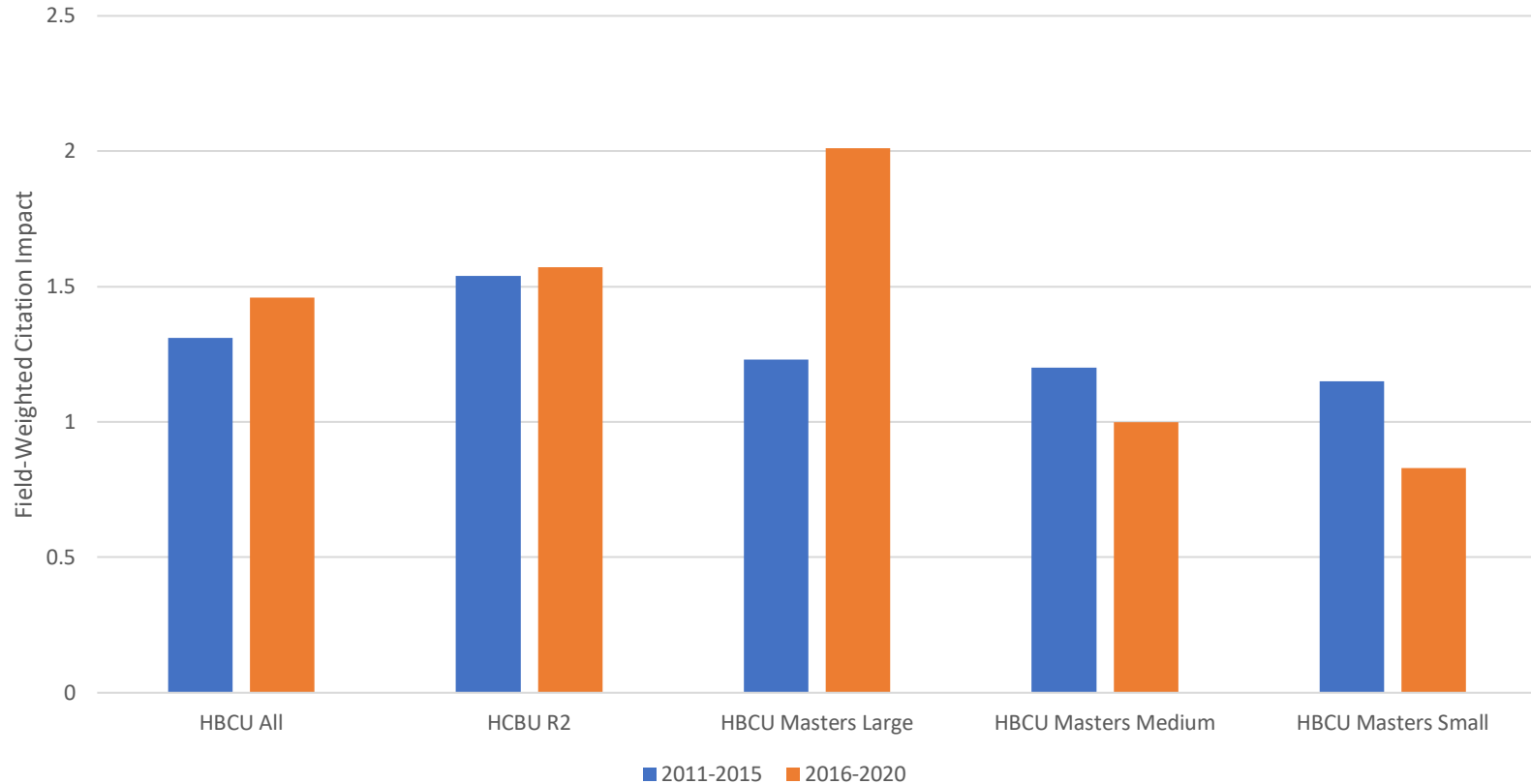




Appendix

HBCU Research Impact, 2011 – 2020

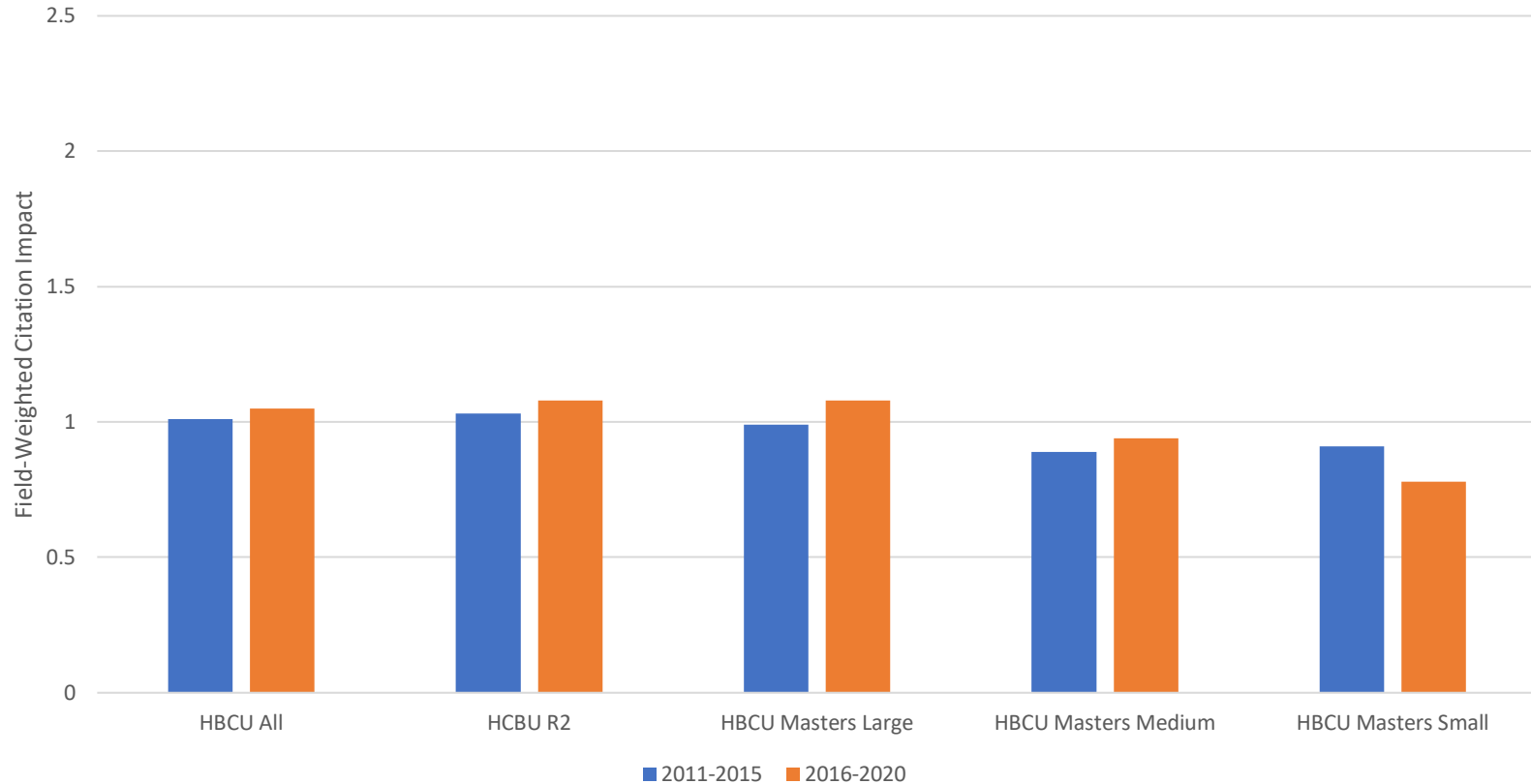
Five Year Comparisons



All publications, not filtered for author count

HBCU Research Impact, 2011 – 2020

Five Year Comparisons

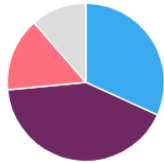


Filtered for Publications with ≤ 100 authors

HBCU Collaboration Type Analysis

Collaboration ⓘ

Scholarly Output in HBCU All 2011-2020, by amount of international, national and institutional collaboration



Metric		Scholarly Output	Field-Weighted Citation Impact
International collaboration	31.8%	14,501	2.51
National collaboration	43.7%	18,817	1.01
Institutional collaboration	18.5%	7,812	0.72
Single authorship (no collaboration)	11.4%	5,212	0.52

All Publications (not filtered for author count)

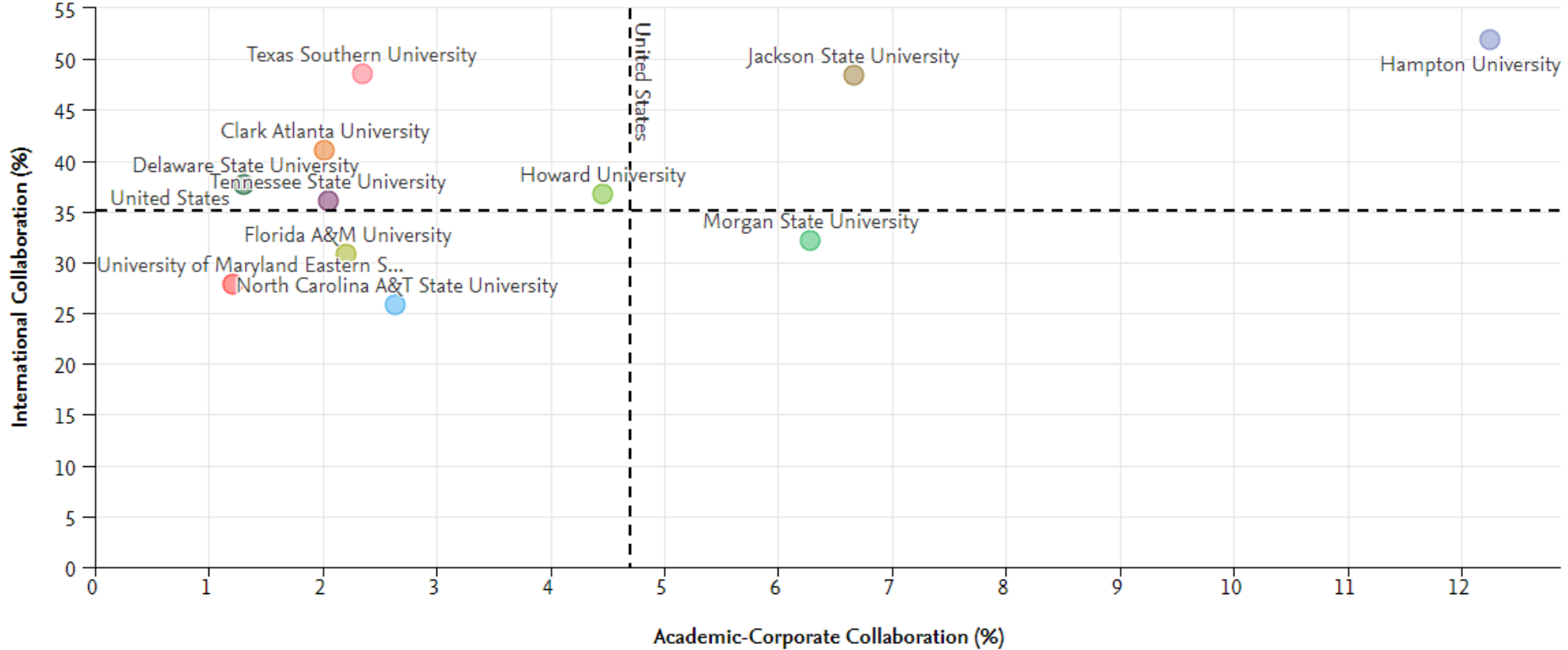
Academic-Corporate Collaboration ⓘ

Scholarly Output in HBCU All 2011-2020 with both academic and corporate author affiliations



Metric		Scholarly Output	Field-Weighted Citation Impact
Academic-corporate collaboration	3.3%	1,492	6.93
No academic-corporate collaboration	96.7%	44,141	1.20

HBCU R2: International & Corporate Collaboration



HBCU R2 Cohort: Overview & Top Keyphrases

Overall research performance

12,717

Scholarly Output ⓘ



[View list of publications](#)

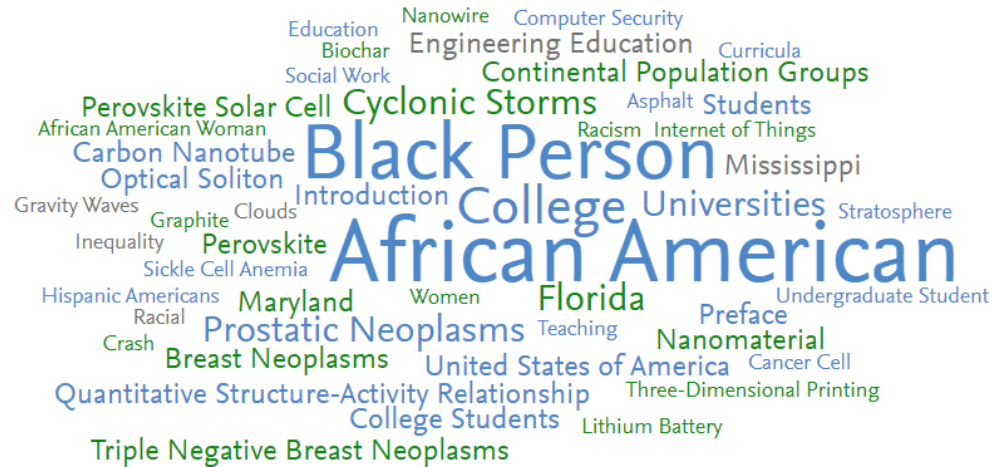
1.54

Field-Weighted Citation Impact ⓘ

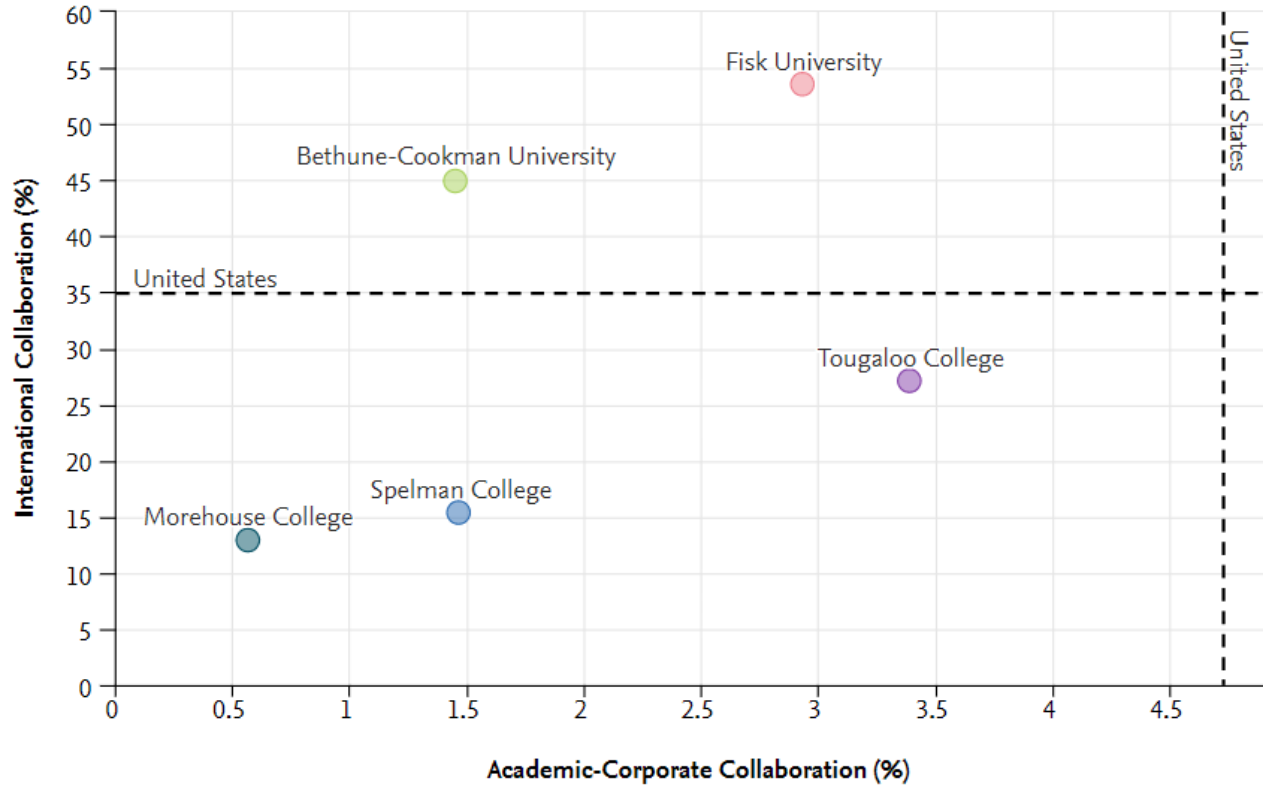


4,572

International Collaboration ⓘ



Baccalaureate Colleges: Collaboration

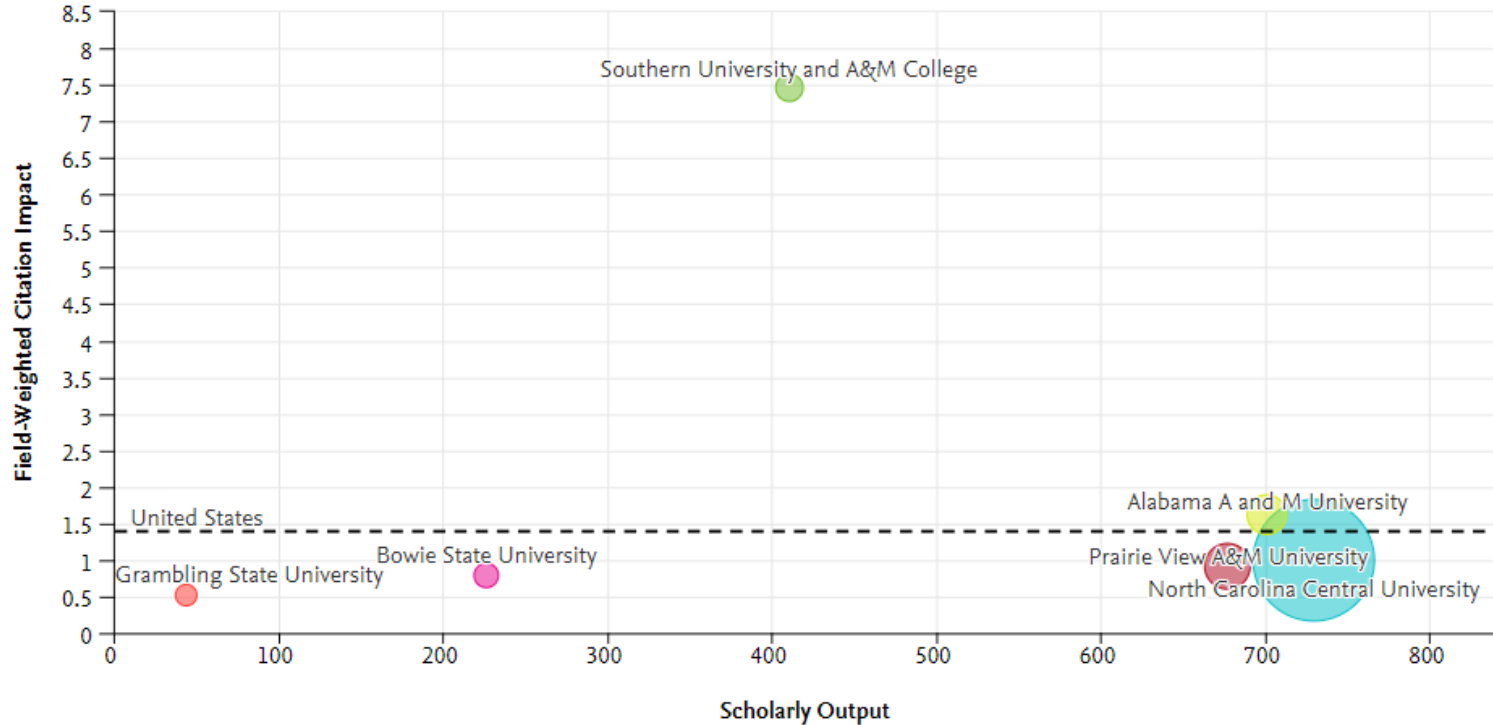


*Top five colleges by scholarly output

Top Corporate Collaborations with HBCU R2 Cohort

	<input type="checkbox"/> Institution	Scholarly Output ↓	Field-Weighted Citation Impact ∨
1.	<input type="checkbox"/>  Science Systems and Applications, Inc.	72	3.54
2.	<input type="checkbox"/>  GATS, Inc.	21	0.70
3.	<input type="checkbox"/>  Brimrose Corporation of America	13	0.54
4.	<input type="checkbox"/>  Battelle	8	0.41
5.	<input type="checkbox"/>  Intel	7	0.71
6.	<input type="checkbox"/>  Leidos Inc	7	2.10
7.	<input type="checkbox"/>  NorthWest Research Associates, Inc.	7	1.43
8.	<input type="checkbox"/>  Corporación Colombiana de Investigación Agropecuaria - Agrosavia	6	1.56
9.	<input type="checkbox"/>  IBM	6	0.91
10.	<input type="checkbox"/>  Science and Technology Corporation, Hampton	6	1.35

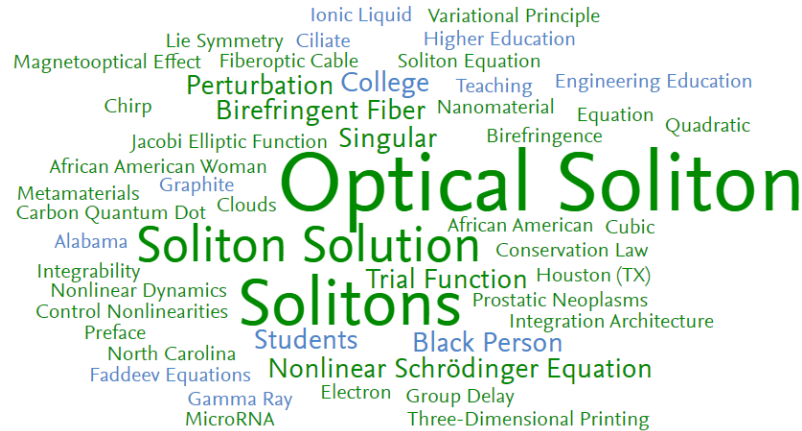
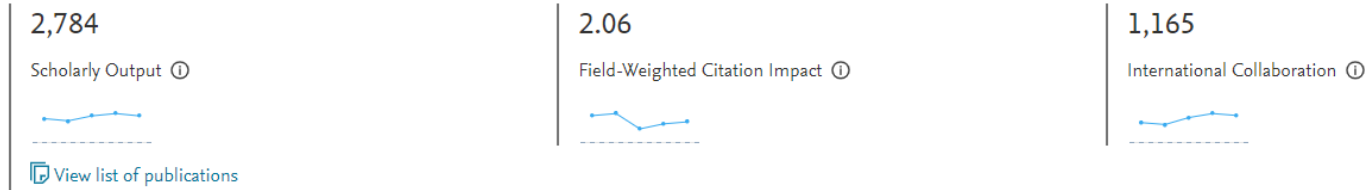
HBCU Master's Programs (Larger): Output, Impact, Funding



Bubble size = volume of NIH & NSF grant award sums

Master's Programs Cohort (Larger): Overview











Overall research performance



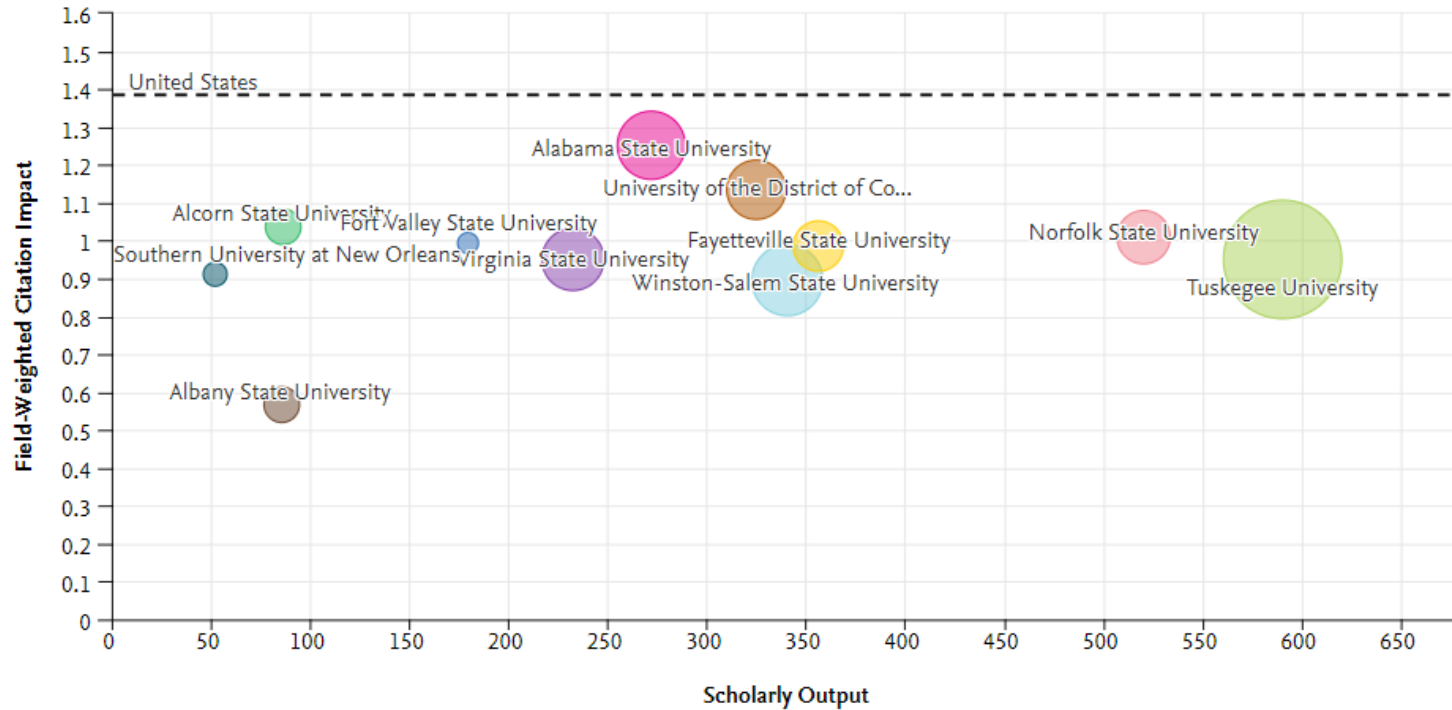
A A A relevance of keyphrase | declining A A A growing (2016-2020)

> Analyze in more detail

Top Corporate Collaborations with Master's (Larger) Cohort

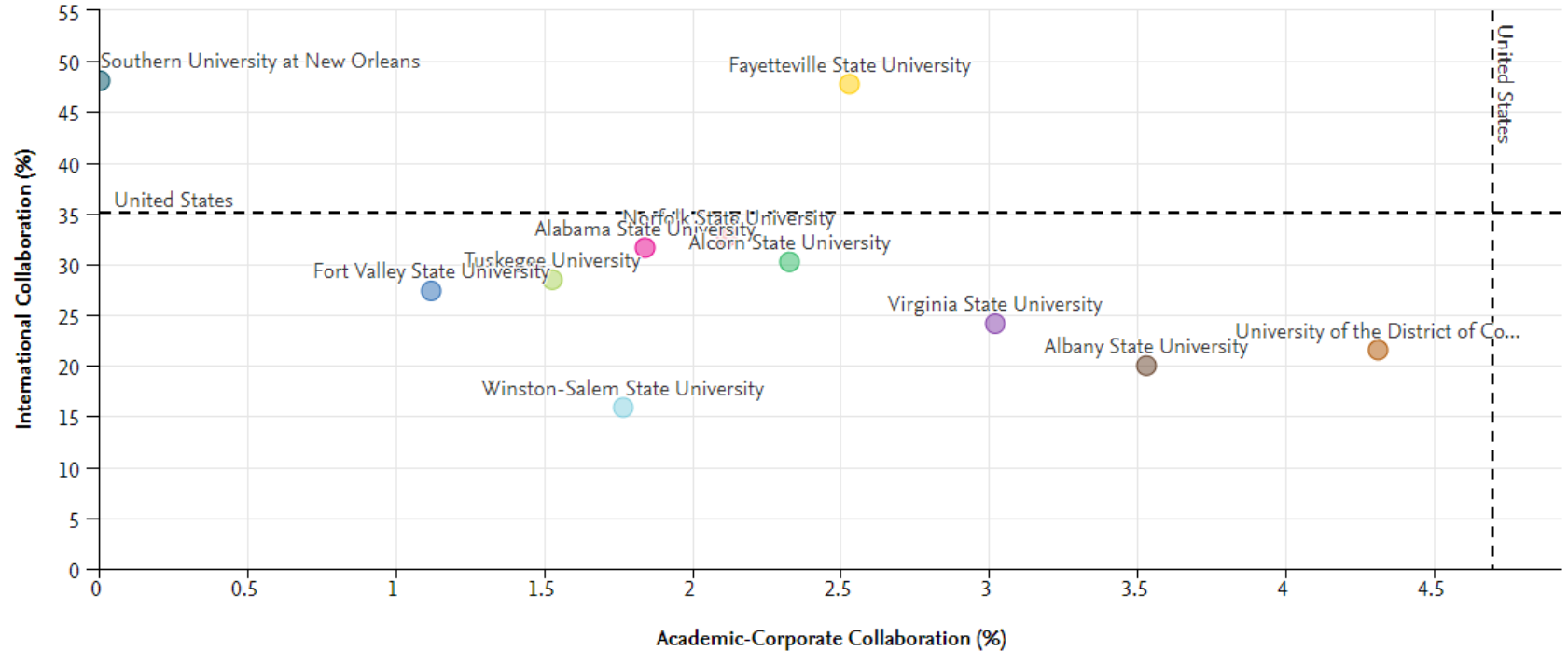
	<input type="checkbox"/>	Institution	Scholarly Output ↓	Field-Weighted Citation Impact ✓
1.	<input type="checkbox"/>	 CoolCAD Electronics	5	2.31
2.	<input type="checkbox"/>	 Cree, Inc.	3	2.07
3.	<input type="checkbox"/>	 Science Systems and Applications, Inc.	3	0.90
4.	<input type="checkbox"/>	 ABB Group	2	11.99
5.	<input type="checkbox"/>	 Alphabet Inc.	2	5.26
6.	<input type="checkbox"/>	 Bionano Genomics Inc.	2	5.26
7.	<input type="checkbox"/>	 Dow Chemical	2	0.93
8.	<input type="checkbox"/>	 General Electric	2	0.64
9.	<input type="checkbox"/>	 Jacobs Engineering	2	1.14
10.	<input type="checkbox"/>	 KBR, Inc	2	0.58

HBCU Master's Programs (Medium): Output, Impact, Funding



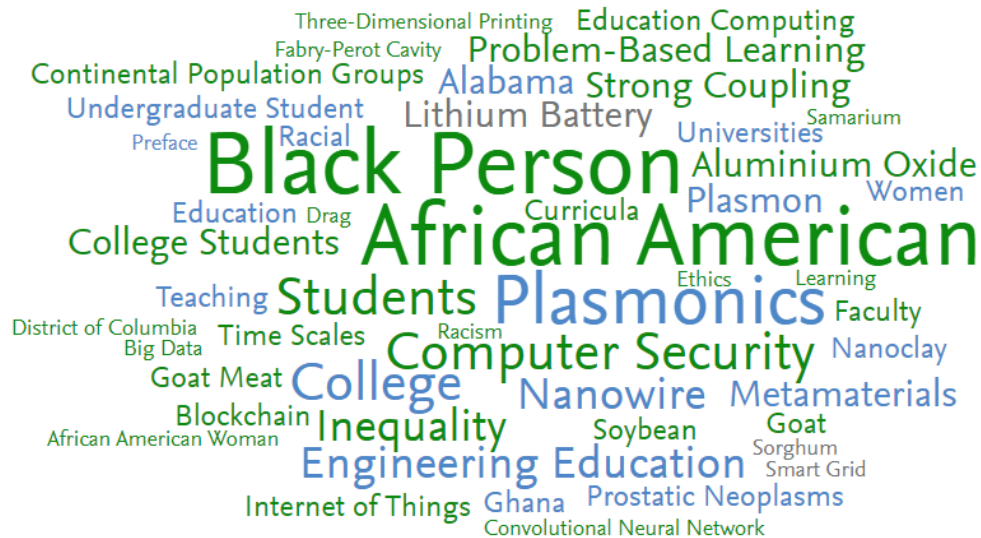
Bubble size = volume of NIH & NSF grant award sums

HBCU Master's Programs (Medium): Collaboration

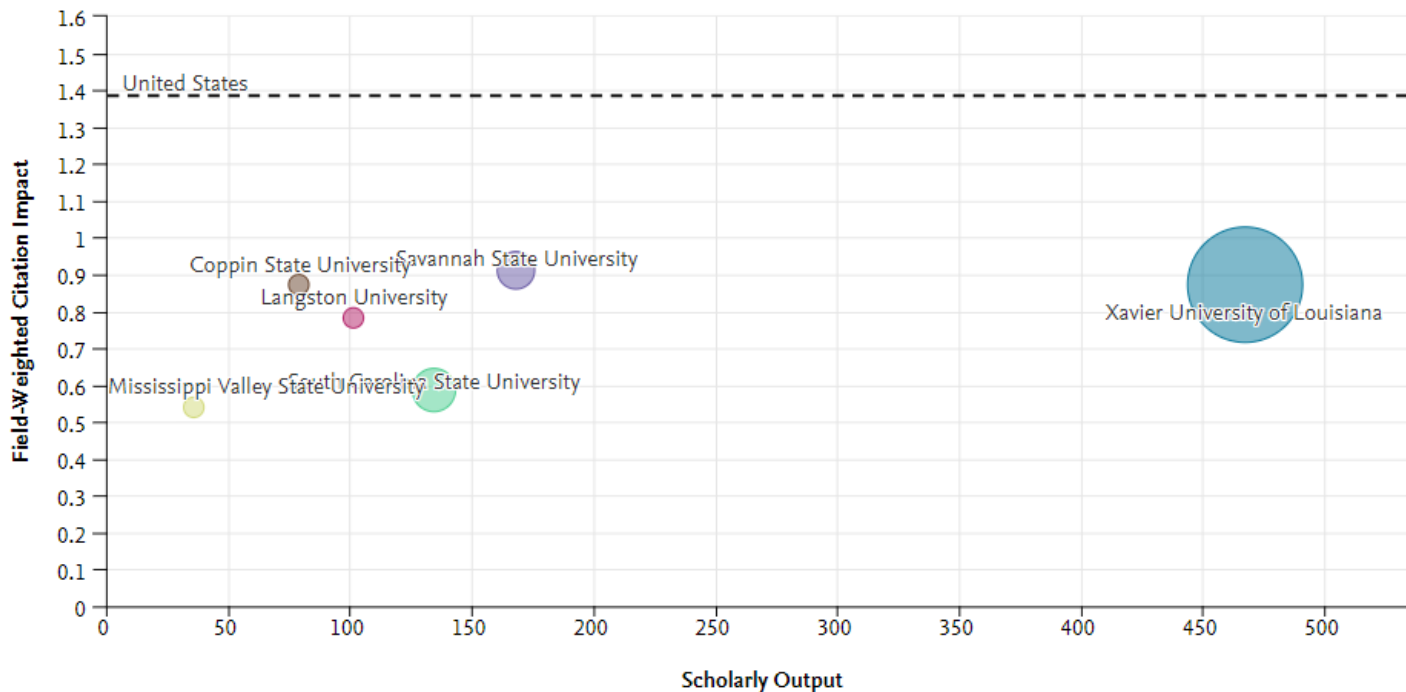


Master's Programs Cohort (Medium): Overview

Overall research performance

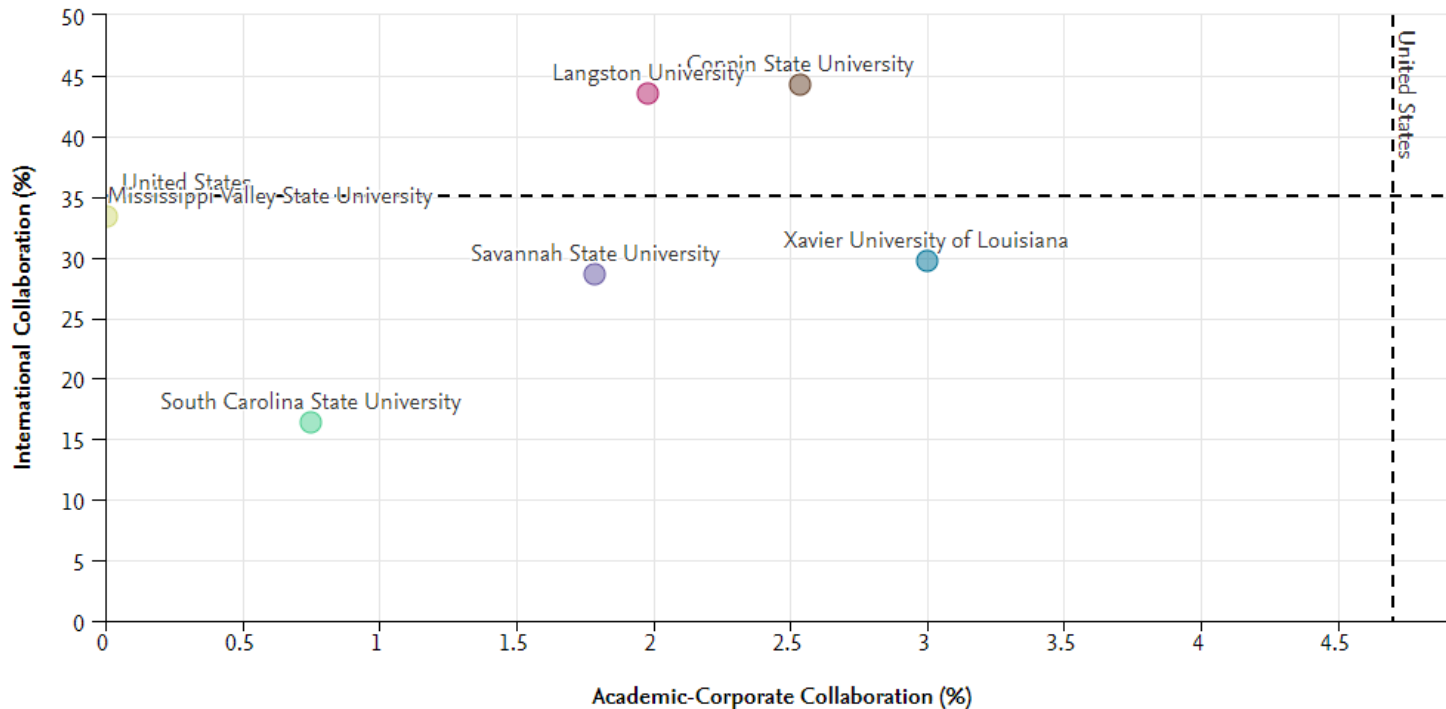


HBCU Master's Programs (Small): Output, Impact, Funding



Bubble size = volume of NIH & NSF grant award sums

HBCU Master's Programs (Small): Collaboration



Top Corporate Collaborations with Master's (Small) Cohort

	<input type="checkbox"/> Institution	Scholarly Output ↓	Field-Weighted Citation Impact ✓
1.	<input type="checkbox"/>  General Research Institute for Non-ferrous Metals China	4	1.97
2.	<input type="checkbox"/>  Leidos Inc	3	1.39
3.	<input type="checkbox"/>  Baidu Inc	2	0.20
4.	<input type="checkbox"/>  Bristol-Myers Squibb	2	1.33
5.	<input type="checkbox"/>  Gilead Sciences, Inc.	2	1.38
6.	<input type="checkbox"/>  Apogee Biotechnology Corporation	1	1.38
7.	<input type="checkbox"/>  Cisco Systems	1	2.69
8.	<input type="checkbox"/>  CleveTheoComp LLC	1	5.73
9.	<input type="checkbox"/>  Global Foundries, Inc.	1	0.61
10.	<input type="checkbox"/>  OSRAM Licht AG	1	0.18

Baccalaureate Colleges: Arts & Sciences Focus Overview



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Scholarly Output ⓘ



[View list of publications](#)

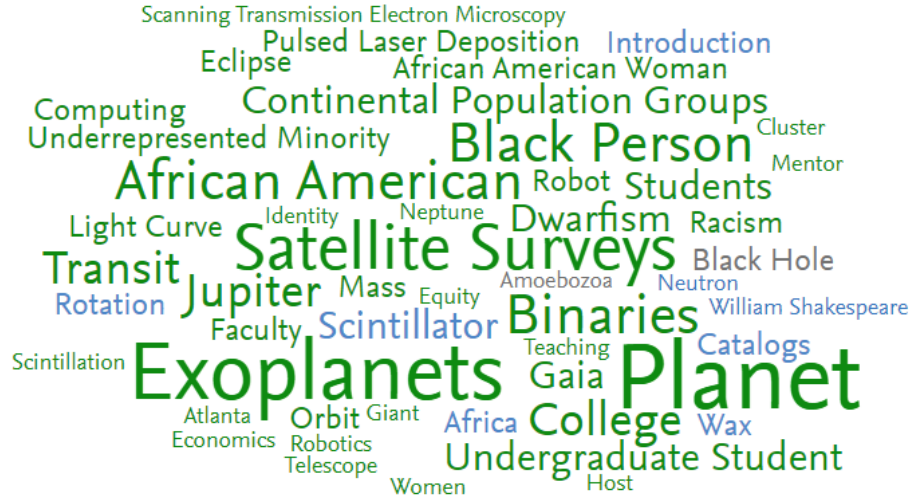
1.09

Field-Weighted Citation Impact ⓘ



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International Collaboration ⓘ



AA A relevance of keyphrase | declining AA A growing ([2016-2020](#))