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How Socially Comparing Emerging Research Institutions to Established Research Institutions Informs Proposed Amendments to the Bayh Dole Act

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**HOW SOCIALLY COMPARING EMERGING
RESEARCH INSTITUTIONS TO ESTABLISHED
RESEARCH INSTITUTIONS INFORMS PROPOSED
AMENDMENTS TO THE BAYH DOLE ACT**

CLOVIA HAMILTON*

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Abstract

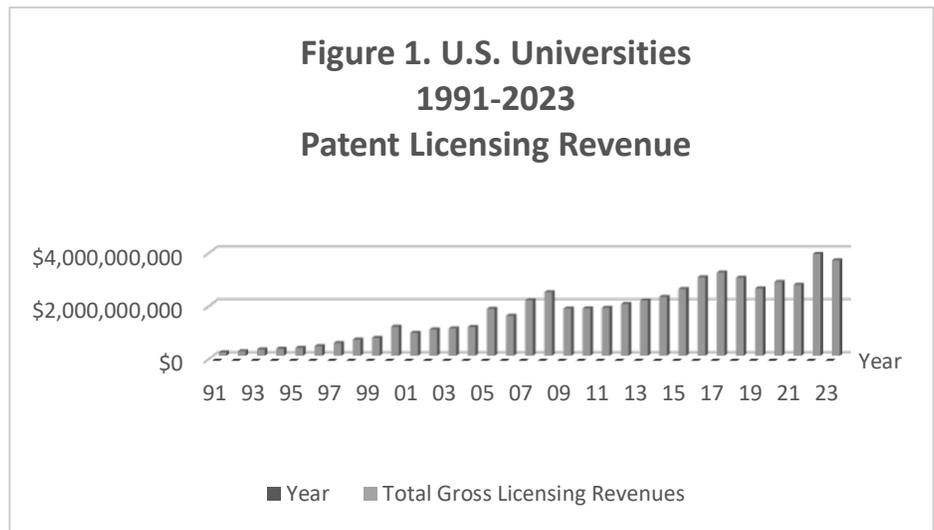
Emerging research institutions have a problem with their lack of tech transfer, including start-up business formations. This study investigates that issue using social comparison theory as the framework for a novel experimental design. A group of 245 respondents, comprised of STEM faculty members and STEM administrators at emerging research institutions, completed a stated-choice survey based on the social comparison theory. The respondents were assessed on the level and extent that they compare their emerging research institution to well established research institutions with respect to research, technology commercialization, and academic entrepreneurship. Historically Black Colleges and Universities (HBCUs) in America were used as a case study. The median survey response was that technology transfer and academic entrepreneurship was not a priority. Respondents also indicated the belief that their HBCUs are not measuring up to majority schools. Based on this comparison, social comparison theory indicates that the HBCUs may be motivated to improve. An amendment to the Bayh Dole Act is recommended, given that HBCUs are woefully behind majority schools in university technology transfer. Specifically, the 37 CFR 401.16 requirements for federal agency reporting should change to require that emerging research institutions report their licensing activities. Further, all national organizations that receive federal funding and report on university patent licensing revenues should be required to provide annual reports on emerging research institutions' technology transfer and academic entrepreneurship activities. This will likely increase awareness and monitoring of this issue.

Key Words

emerging research institutions, HBCU, minority serving institutions, higher education, patents, patent licensing, STEM, R&D, inventions, inventors, black inventors, technology transfer, university technology transfer, technology commercialization, TTO, technology transfer office, technology managers, technology management, academic entrepreneurship, start-ups, spin-offs, stated-choice surveys, social comparison theory, university partnerships, academic partnerships, Bayh Dole Act

I. INTRODUCTION

University technology transfer refers to research universities using marketing and licensing tactics to transfer inventions from their university to existing companies, newly-created university spin-off companies, or other startup companies.¹ According to the Association of University Technology Managers (AUTM), in 2023, well-established United States (U.S.) research institutions reported \$3.6 billion in licensing revenue,² indicating that many established research institutions are successfully commercializing their technology. This is evidenced by the steady rise in established research institution licensing revenues. AUTM documented that U.S. gross licensing revenues ranged from 129,981,898 USD to 3,603,961,984 USD between 1991 and 2023. See Figure 1.³



¹ *What is Tech Transfer, Anyway*, ASSOC. OF UNIV. TECH. MANAGERS (AUTM), <https://autm.net/about-tech-transfer/what-is-tech-transfer> (last visited Dec. 13, 2025).

² *2023 licensing survey*, AUTM (2023), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2023-licensing-survey> (last visited Dec. 13, 2025).

³ This data was culled from the AUTM annual licensing survey database AUTM, *AUTM STATT Annual Subscription*, AUTM, available at https://register.autm.net/detail.aspx?id=STATT_ANNUAL.

Stated-choice methods can be used to model consumer preferences.⁴ This study used a stated-choice survey method to analyze academic technology transfer and entrepreneurship to investigate why emerging research institutions lag behind established research institutions.⁵ The study discovers whether and how emerging research institutions' representatives compare their university to established research institutions regarding technology transfer, partnerships between academia and industry, and tech-based business ventures performance.

The Federal Demonstration Partnership (FDP) of the National Academies of Sciences (NAS) is a program convened by the Government-University-Industry Research Roundtable (GUIRR).⁶ In the past, the FDP defined "emerging research institutions" as institutions that were relatively new to managing federal funds and received less than \$20 million in federal research and development (R&D) annual funding, which is tracked by the National Science Foundation (NSF)'s National Center for Science and Engineering Statistics website (formerly, the Science Resources Statistics (SRS) website).⁷ In addition, emerging research institutions were defined as receiving funding from at least two FDP federal agencies.⁸

Today, the NSF uses the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act's definition of emerging research institutions.⁹ They cite 42 U.S. Code § 18901, which states that an emerging research institution has an established undergraduate or graduate program with less than \$50 million in federal research expenditures.¹⁰ See Table 1 in Appendix A for the research expenses of Historically Black Universities and Colleges (HBCUs) with doctoral programs. All of the HBCUs are emerging research institutions, with the exception of Morgan State University and Howard University.¹¹

⁴ Alberto Garcia-Diaz, et al., *Using Orthogonal Arrays to Design Stated-Choice Surveys in Transportation Planning*, in 60th Annual Conference and Expo of the Institute of Industrial Engineers 2010 Proceedings of the Industrial and Systems Engineering Research Conference - Cancun - Institute of Industrial Engineers. 112–118 (2010).

⁵ Clovia Hamilton, *A Toolkit for Building HBCU Technology Transfer Supply Chain Networks using an Advanced Planning System* 1, 5 (2016) (Ph.D. dissertation, Univ. of Tenn.).

⁶ The National Academies of Sciences, Engineering, and Medicine, *Federal Demonstration Partnership: Redefining the Government University Research Partnership* (Federal Demonstration Partnership ed., The National Academies 2012).

⁷ David Wright, *The Federal Demonstration Partnership Solicitation to Participate in Phase V, NATIONAL SCIENCE FOUNDATION 4* (2008), <http://www.nsf.gov/pubs/fdp/phasevsol.pdf>.

⁸ *Id.*

⁹ *NSF by the Numbers - Information - Consolidated Glossary*, U.S. NATIONAL SCIENCE FOUNDATION (NSF), <https://new.nsf.gov/about/about-nsf-by-the-numbers/information>.

¹⁰ *Id.*; see also 42 U.S.C. § 18901(5) (2025).

¹¹ See Appendix A, *infra*.

In December 2018, HBCU Money, a financial platform for HBCUs, students, alumni, and supporters, argued that HBCUs need to find creative solutions to their financial issues.¹² This news source noted that after desegregation gutted HBCUs, these institutions of higher education have taken on a:

check to check mentality in dealing with [their] financial viability. Instead of investments in R&D and entrepreneurship...which is where the nation's wealth has truly been generated for colleges and their alumni, we have seen far too many HBCUs and their alumni seemingly double down on being dependent on tuition revenue,...[and] poor investments in athletics with no real return possible, focusing their students on getting jobs not creating them, and at times a feeling of lip service...to developing...alumni programs that would strengthen giving.¹³

To help emerging research institutions like HBCUs achieve financial stability with licensing revenue, the first step is to study how emerging research institution representatives perceive their institution in comparison to other institutes of higher education. Once these perceptions are known, university research science, technology, and engineering and math (STEM) faculty have a basis for future directives and a motivation to improve their own performance.

Psychologist Leon Festinger crafted the social comparison theory,¹⁴ which explains that upward comparisons are made to individuals or groups believed to be better, and downward comparisons are made to those perceived to be worse off.¹⁵ If a group believes that their own abilities and efforts do not measure up, they may be motivated to make improvements.¹⁶ This may be true for an emerging institution whose STEM faculty compares their employer to a majority school that is engaged in technology transfer. In this study, a stated-choice survey measured how emerging research institution representatives compare their institution to colleges and universities identified as established research institutions.

¹² HBCU Money, *A Patent Created Is A Million Earned: HBCUs Are Not Keeping Pace In The Intellectual Property Arms Race Among American Colleges*, HBCU MONEY (Dec. 5, 2018), <https://hbcumoney.com/2018/12/05/a-patent-created-is-a-million-earned-hbcus-are-not-keeping-pace-in-the-intellectual-property-arms-race-among-american-colleges/>.

¹³ *Id.*

¹⁴ See generally Leon Festinger, *A Theory of Social Comparison Processes*, 7 HUMAN RELATIONS, 1, 7, 10–11 (1954).

¹⁵ See generally *id.*

¹⁶ *Id.* at 5.

This study proposes that legislators seeking to help universities take ownership of their inventions developed through government funding were likely not focusing on emerging research institutions. Unfortunately, these schools are not taking advantage of the potential financial awards of technology commercialization.

Thus, this study surveys STEM faculty and administrators at emerging research institutions. There are several different types of emerging research institutions.¹⁷ For example, they differ by Carnegie classification, highest degree offered and Minority Serving Institute (MSI) designation.¹⁸ Here, HBCUs are used as a case study. Respondents were asked whether they make comparisons between their HBCU employers and majority schools. The faculty were also asked open-ended questions about whether technology commercialization and academic entrepreneurship is a priority at their HBCU.

Part II of this article compares technology transfer in established U.S. higher education research institutions to technology transfer in emerging research institutions. Part III of this study discusses the social comparison theoretical framework and propositions for this study. Part IV discusses the methodology used to design the survey instrument. Part V gives an overview of the survey results. Part VI discusses the findings. Part VII recommends solutions for emerging research institutions like HBCUs that are behind in technology transfer.¹⁹ Part VIII provides conclusions drawn from this research study.

II. BACKGROUND

A. *Technology Transfer at Established Research Institutions*

Congress passed the Bayh-Dole Act in 1980.²⁰ This law made it possible for academic institutions to acquire ownership rights to innovations produced through government-funded research.²¹ Traditionally, technology transfer offices, or TTOs, oversaw this.²² These departments manage research universities' intellectual property portfolios—primarily patents and patent licensing.²³

¹⁷ U.S. DEP'T OF ENERGY, OFF. OF SCI., *Institution Designation/Classifications*, <https://science.osti.gov/grants/Applicant-and-Awardee-Resources/Institution-Designations> (last visited Dec. 13, 2025).

¹⁸ *Id.*

¹⁹ Hamilton, *supra* note 5.

²⁰ Eyal Press & Jennifer Washburn, *The Kept University*, ATLANTIC MONTHLY, 39 (Mar. 2000).

²¹ *Id.*

²² *Id.*

²³ *Id.*

Congress passed the Bayh-Dole Act in response to worries about Japan's growing competitiveness and the U.S.'s falling productivity.²⁴ There was also unease with the government's uneven handling of inventions under contracts.²⁵ Nearly two decades of campaigning to promote technology transfer led to the Act's enactment.²⁶ The Act consolidated numerous laws that had been introduced over a long period of time with the goal of creating a unified government patent ownership policy.²⁷ Universities were viewed by the government and business community as hubs for education, basic and applied research, and the development of ideas with economic potential.²⁸ In order to achieve this, the Bayh Dole Act shifted the assumption of title to any innovation created by universities, small enterprises, and other nonprofit organizations using government funds from the government to the grantee or contractor.²⁹ The Bayh Dole Act establishes a framework that allows universities, small businesses, and nonprofits to elect to retain title to inventions made with federal funding, provided they comply with certain disclosure and reporting requirements.³⁰

After its first 20 years, the Bayh-Dole Act was criticized for having high licensing transaction costs compared to the benefits of university-industry deals, several low-value agreements, licensing deals that had little chance of actually producing anything of commercial value, and valuation issues with early-stage inventions.³¹ Critics were concerned that university technology commercialization distorted the character and focus of academic basic research

²⁴ *Id.*

²⁵ Lawrence Rudolph, *Overview of Federal Technology Transfer*, 5 RISK: HEALTH, SAFETY & ENVIRONMENT 133, 134 (1994).

²⁶ *Id.*

²⁷ 35 U.S.C. §§ 200-212 (2025).

²⁸ Clovia Hamilton & Simon P. Philbin, *Knowledge based view of university tech transfer—A systematic literature review and meta-analysis*, 10 ADMIN. SCI. 1, 2 (2020).

²⁹ 35 U.S.C. § 202(a) (2018); see *Hamilton, supra* note 28, for a sample list of prominent products invented at universities that are now in the commercial marketplace. See Clovia Hamilton, *University Technology Transfer and Economic Development: Proposed Cooperative Economic Development Agreements Under the Bayh-Dole Act*, 36 J. MARSHALL L. REV. 397, 405–06 (2002), for a discussion of land grant institutions and federal agencies history with technology transfer.

³⁰ 35 U.S.C. § 202(a) (2018); see also FASTERCURES, MILKEN INST., *The Bayh-Dole Act of 1980: Frequently Asked Questions*, <https://milkeninstitute.org/sites/default/files/reports-pdf/Bayh-Dole-FAQ.pdf> (last visited Dec. 13, 2025).

³¹ Rebecca S. Eisenberg, *The University Office of Technology Transfer: A Review of the Current U.S. System*, in *Streamlining Int'l Intellectual Property, Enforcement and Prosecution, University Technology Transfer, and Incentives for Inventors*, 56, 62 (Jul. 23-24, 1999). Presented at the 1999 High Technology Protection Summit Incentive for Basic Innovation: Inventions and Work Developed by Universities and Venture Companies - University of Washington, Seattle, WA, CASRIP Publication Series (1999).

enterprises.³² There were also concerns about possible conflicting professional and financial incentives of faculty members in patent licensing arrangements.³³ The conflict-of-interest concern was exacerbated when research institutions purchased equity interests in commercial enterprises.³⁴ By 2000, 20 years after the Act was passed, opponents contended that Bayh-Dole had failed to fulfill its mandate to boost business activity.³⁵ However, 44 years later, there has been a clear rise in university licensing revenues over time. See Figure 1.

University technology transfer activities and performance outcomes have been extensively studied. For example, during his time with the University of Georgia, current Colorado State University business professor Dr. Gideon Markman and his team interviewed 128 university TTO directors to study which TTO organizational frameworks and licensing strategies promote the formation of new ventures.³⁶ They also studied how the various TTOs' organizational frameworks and licensing strategies relate to one another.³⁷ They concluded that: (1) equity licensing for equity was positively related to new venture formation; (2) licensing for sponsored research was negatively related to new venture formation; and (3) licensing for cash was the least related to new venture formation.³⁸

In addition, there are U.S. research universities that have established in-house programs that help fund the development of technology.³⁹ Further, with respect to financing start-ups, some universities lower royalties and take equity interests instead of cash royalty payments to help make entrepreneurial ventures more affordable.⁴⁰ Successful technology licensing depends on the expertise of the TTO staff.⁴¹ If spinning off companies is an objective of a research

³² NATIONAL SCIENCE BOARD (NSB), 1 *Science and Indicators 2000*, 6-56 (2000), https://archive.org/details/DTIC_ADA378464; see also NATIONAL SCIENCE BOARD, *Home*, NATIONAL SCIENCE FOUNDATION (2025), <https://www.nsf.gov/nsb>, noting that “[t]he National Science Board establishes the policies of the U.S. National Science Foundation and serves as advisor to Congress and the president. The board approves major NSF awards, provides congressional testimony and issues statements relevant to the nation’s science and engineering enterprise.”

³³ NATIONAL SCIENCE BOARD (2000), *supra* note 32.

³⁴ *Id.*

³⁵ David C. Mowery, et al., *The Growth of Patenting and Licensing by U.S. Universities: An Assessment of the Effects of the Bayh-Dole Act of 1980*, 30 RSCH. POL’Y. 99, 100 (2001).

³⁶ Gideon D. Markman, et al., *Entrepreneurship and University-Based Technology Transfer*, 20 J. BUS. VENTURING 241, 256–57 (2005).

³⁷ *Id.*

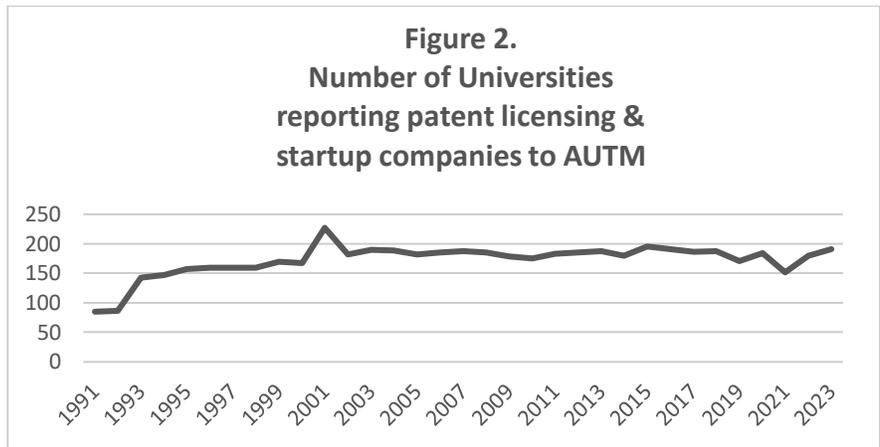
³⁸ *Id.*

³⁹ Scott Shane & Toby Stuart, *Organizational Endowments and the Performance of University Start-ups*, 48 MGMT. SCI. 154–55 (2002).

⁴⁰ *Id.* at 165.

⁴¹ John Dodds & Susanne Somersalo, *Practical Considerations for the Establishment of a Technology Transfer Office*, in *Intell. Prop. Mgmt. in Health and Agricultural Innovation*:

university, then the TTOs need staff that have expertise in forming businesses, including business planning, fund raising, and marketing experience.⁴² Thus, with adequate resources, emerging research institutions can conceivably become more self-reliant financially by increasing their involvement in university technology transfer, partnerships between academia and industry, and tech-based business ventures. In the AUTM annual licensing survey, universities report the number of licensing deals, amount of licensing revenues and number of startup businesses that they form. Figure 2 shows the increase of established research institutions' reports to AUTM between 1991-2023. Reports have grown over the years from 85 in 1991 to 191 in 2023. Despite the overall growth, few emerging research institutions and virtually no minority serving institutions such as HBCUs have reported to AUTM.



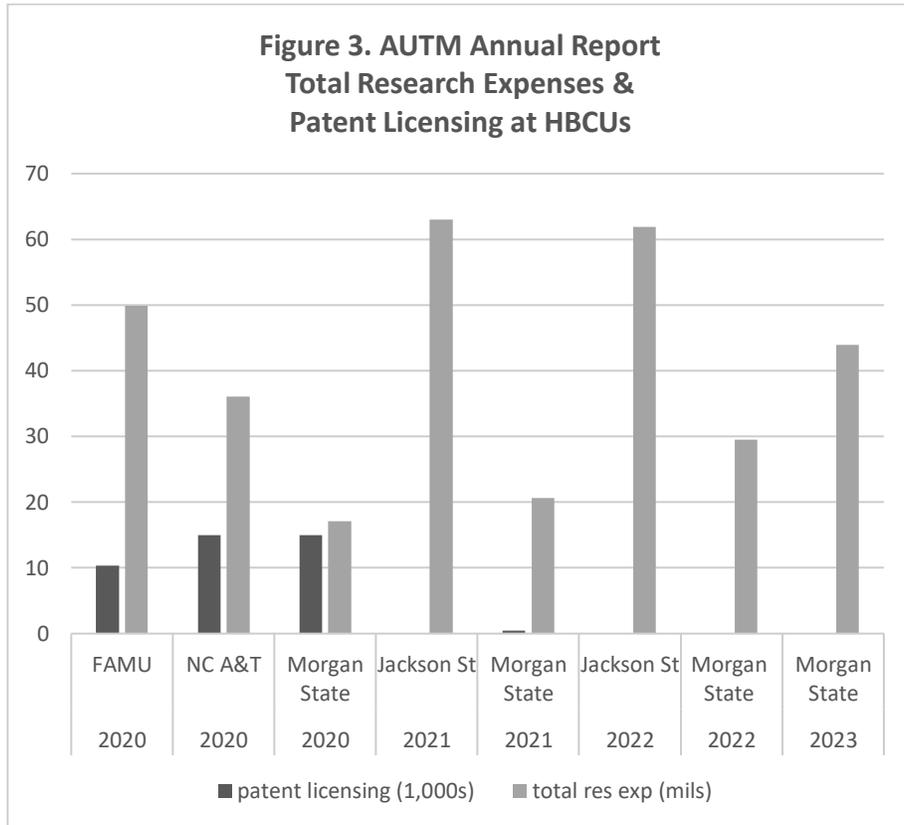
The good news is that there seems to be movement in a positive direction. In the review of AUTM’s annual licensing survey reports, the HBCU North Carolina Agricultural and Technical State University (North Carolina A&T) reported licensing activity in 2003, 2004 and 2006.⁴³ Florida Agricultural and Mechanical University (Florida A&M), Morgan State University, and North Carolina A&T reported research expenses in 2020 of \$10,300, \$15,000, and

A Handbook of Best Prac., 576 (Anatole Krattiger, et al., eds., MIHR & PIPRA 2007), available at https://ipmall.info/sites/default/files/hosted_resources/IP_handbook/ch06/ipHandbook-Ch%2006%2005%20Dodds-Somers%20Establishing%20TTOs-Practical.pdf; see also Bo Carlsson & Ann-Charlotte Fridh, *Technology transfer in United States universities*, 12 J. OF EVOLUTIONARY ECON. 199, 199–232 (2002).

⁴² See *id.*

⁴³ This data was culled from the AUTM annual licensing survey database AUTM, *AUTM STATT Annual Subscription*, AUTM, available at https://register.autm.net/detail.aspx?id=STATT_ANNUAL.

\$15,000, respectively.⁴⁴ Morgan State University and Jackson State University reported \$500 and \$0 in expenses, respectively, in 2021.⁴⁵ They both participated in the 2022 AUTM survey but reported no patent licensing revenues.⁴⁶ And Morgan State University participated in the 2023 survey.⁴⁷ While the total research expenses that were reported are impressive, there is opportunity for these HBCUs to improve their technology commercialization efforts. See Figure 3.



⁴⁴ AUTM, *2020 licensing survey*, (2020), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2020-licensing-survey>.

⁴⁵ AUTM, *2021 licensing survey*, (2021), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2021-licensing-survey>.

⁴⁶ AUTM, *2022 licensing survey*, (2022), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2022-licensing-survey>.

⁴⁷ AUTM, *2023 licensing survey*, (2023), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2023-licensing-survey>.

Given that nearly 200 majority institutions of higher education participate in the AUTM annual survey⁴⁸, it is refreshing to see the HBCUs begin to do the same. And there is potential for their R&D expenditures to result in inventions that can be commercialized and used to earn licensing revenues.

B. Technology Transfer at Emerging Research Institutions – The HBCU Case Study

As noted earlier, nearly all HBCUs that offer doctorate research programs are classified as emerging research institutions. See Table 1 in Appendix A.⁴⁹ HBCU administrators have complained of being severely under-resourced and of a decline in financial support from government sources.⁵⁰ Although this problem has been investigated with U.S. Air Force and National Academy of Sciences (NAS) support,⁵¹ the problem has continued and has lingered for decades.⁵² HBCUs classified as Doctoral Research institutions have made progress since earlier studies of their research and tech transfer capabilities in the 1990s and in 2009 by the Department of Defense (DOD) and NAS, respectively.⁵³

Despite the progress, the schools are still heavily teaching-oriented,⁵⁴ lack patents, and lack tech transfer operations.⁵⁵ In comparison, over the past 32

⁴⁸ AUTM, *2023 licensing survey*, (2023), <https://autm.net/surveys-and-tools/surveys/licensing-survey/2023-licensing-survey>.

⁴⁹ See U.S. DEP'T OF EDUC., *National Center for Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS)*, (2022-2024), <https://nces.ed.gov/ipeds/datacenter/InstitutionByName.aspx?stepId=1&sid=f4f3a026-7d69-4692-bcf0-64dba7d12dd8&rtid=6>, to see the examining profiles of HBCUs with graduate degree programs. These HBCUs have Carnegie Classifications of at least Masters college as listed in the U.S. Department of Education's NCES IPEDS database.

⁵⁰ Willis A. Jones, *Prestige Among Black Colleges: Examining the Predictors of HBCU Peer Academic Reputation*, 17 J. AFR. AM. STUD. 129, 130 (2013).

⁵¹ NAT'L ACAD. OF ENG'G AND NAT'L RSCH. COUNCIL, *Partnerships for Emerging Research Institutions Report of a Workshop*, (2009); see also Technical Assistance to HBCU/MIs to Increase Capabilities. No. F49620-94-C-0013 (1996); see also National Science Foundation (NSF) National Center for Science and Engineering Statistics, *Survey of Academic R&D expenditures FY 2009*; see also Customized Blueprints to enhance the participation of HBCU/MIs in DoD-Related R&D Programs. (1991).

⁵² Jones, *supra* note 50.

⁵³ NAT'L RSCH. COUNCIL, *Engineering in K-12 Education: Understanding the Status and Improving the Prospects*, DC: The National Academies Press (2009); see also Samuel Sullivan, *Technical Assistance to HBCU/ MIs to Increase Capabilities*, Bolling AFB, DC: AIR FORCE OFF. OF SCI. RSCH. (AFOSR), (July 31, 1996).

⁵⁴ M. CHRISTOPHER BROWN II & KASSIE FREEMAN, *BLACK COLLEGES: NEW PERSPECTIVES ON POLICY AND PRACTICE 9* (Bruce Anthony Jones ed., Praeger, 2004).

⁵⁵ Rebecca O. Bagley, *Why We Need More Minority Tech-Entrepreneurs*, FORBES, (Nov. 1, 2013, 12:43 PM).

years, non-HBCUs have increased their licensing revenues. See Figure 1. Thus, these emerging research institutions can learn from these established research institutions.

Since 2022, there have been 99 HBCUs.⁵⁶ U.S. institutions of higher education are recognized and classified with the Carnegie Classification framework.⁵⁷ The framework and its designations are set by the Carnegie Foundation for the Advancement of Teaching and the American Council on Education.⁵⁸ A “Research 1” institution (commonly called R-1) has “[v]ery [h]igh [s]pending and [d]octorate [p]roduction.”⁵⁹ For a U.S. institution to be designated as R-1, it must spend an average of \$50 million annually on research & development (R&D) and produce at least 70 research doctorates.⁶⁰ The R-2 designation is defined as an institution spending \$5 million on R&D and conferring at least 20 research doctorates on average in a single year.⁶¹ Top research institutions must also have sound research administration infrastructure and ethical practices.⁶² Once government and private industry R&D sponsors receive this signal, these HBCUs will likely receive more R&D opportunities and an increase in future funding. This helps institutions of higher education attract top faculty talent, graduate students, and undergraduate students. And the R-1 institutions contribute significantly to solving real-world problems and developing new fields of study.

Three HBCUs are well on their way to R-1 status: Morgan State University, North Carolina A&T University, and Howard University.⁶³ For example, in 2023, Morgan State reported \$100.8 million in grants, contracts and gift funding.⁶⁴ A high budget signifies to government and private research sponsors that this institution could manage at least \$50 million responsibly.

⁵⁶ NAT’L CTR. FOR EDUC. STAT. (NCES), *Historically Black Colleges and Universities*, NCES (n.d.), <https://nces.ed.gov/fastfacts/display.asp?id=667>.

⁵⁷ AM. COUNCIL ON EDUC. (ACE), *Carnegie Classification of Institutions of Higher Education - About*, <https://carnegieclassifications.acenet.edu/about/> (last visited Dec. 13, 2025).

⁵⁸ *Id.*

⁵⁹ CARNEGIE CLASSIFICATIONS OF INST. OF HIGHER EDUC., *2025 Research Activity Designations*, ACE (2025), <https://carnegieclassifications.acenet.edu/carnegie-classification/classification-methodology/2025-research-activity-designations/>.

⁶⁰ *Id.*

⁶¹ *Id.*

⁶² See Sara Weissman, *Howard Expects to Gain R-1 Status. Other HBCUs Will Follow.*, INSIDE HIGHER EDUC., (Dec. 5, 2024).

⁶³ *Id.*

⁶⁴ Morgan State U, *Morgan State University Advances Toward R1 Status, Securing Investments of More Than \$100M in grants, Contracts and Gifts During FY23*, MORGAN STATE UNIVERSITY (Aug. 1, 2023); see also Table 1 herein Appendix A. (Morgan State University reported \$82 million in research expenditures to the U.S. Department of Education for FY 2023).

Some HBCUs are also making strides to increase their patenting.⁶⁵ For example, while a doctoral student in Applied Physics from Alabama Agricultural and Mechanical University, Dr. Sherita Moses was awarded a patent for a “compound of gold nanoparticles and plant extracts created to cause cytotoxicity in triple negative breast cancer without harming healthy cells.”⁶⁶ And in 2012, Florida A&M University’s professor of pharmaceutical sciences, Dr. Seth Ablordeppey, received a patent for modifying the Cryptolepine drug which fights infections.⁶⁷

In 2014, Dr. Vida A. Dennis of Alabama State University was issued a patent for the use of gold nanoparticles that attach to the protein of a virus to stop its growth.⁶⁸ Also in 2014, the founder of the *IPWatchdog* website reported on a number of patents filed by and issued to HBCU faculty inventors.⁶⁹ For example, Xavier University received a patent for a new method of treating heroin addiction which allows dosages only once every 3-6 months rather than daily.⁷⁰

In 2019, Dr. Charles Magee of Florida A&M University received a patent for a cooling vest.⁷¹ In 2020, Dr. Mukti Rana, professor of physics and engineering at Delaware State University, was awarded three patents related to a newly-discovered alloy material.⁷² North Carolina A&T University mechanical engineering professor Dr. Mannur J. Sundaresan and his former advisee, Dr. Letchuman Sripragash, received a patent for detecting defects in

⁶⁵ Mirtha Donastorg, *HBCUs Continue to Get New Patents, Though Disparities Remain*, THE PLUG, (Nov. 3, 2021).

⁶⁶ Dr. Sherita L. Moses, *Associate Professor of Physics*, Georgia Gwinnet College Directory, (last visited Nov. 4, 2025)

⁶⁷ JBHE, *Florida A&M University Professor Receives a U.S. Patent for Infection-Fighting Drug*, J. BLACKS HIGHER EDUC. (2012), <https://jbhe.com/2012/06/florida-am-university-professor-receives-a-u-s-patent-for-infection-fighting-drug/> (Dr. Ablordeppey stated that the research took more than a decade. This “new drug will be effective in treating infections in organ transplant patients, people with HIV/AIDS, and patients undergoing chemotherapy.”).

⁶⁸ JBHE, *Alabama State University Scientists Receive Patent for Treatment of Respiratory Illness*, J. BLACKS HIGHER EDUC. (Oct. 3, 2014), <https://jbhe.com/2014/10/alabama-state-university-scientists-receive-patent-for-treatment-of-respiratory-illness/>.

⁶⁹ Gene Quinn & Steve Brachmann, *Innovation at Historically Black Colleges and Universities*, IP WATCHDOG, (Feb. 17, 2014, 11:41 AM).

⁷⁰ JBHE, *Xavier University Patents New Method to Treat Heroin Addiction*, J. BLACKS HIGHER EDUC. (Jan. 31, 2014), <https://jbhe.com/2014/01/xavier-university-patents-new-method-to-treat-heroin-addiction/>.

⁷¹ Byron Dobson, *Florida A&M University Professor Charles Magee Awarded Patent for "cooling vest"*, TALLAHASSEE DEMOCRAT, (Apr. 29, 2019, 10:13 AM), <https://www.tallahassee.com/story/news/local/famu-news/2019/04/29/famu-professor-charles-magee-gets-patent-cooling-vest/3542398002/>.

⁷² DELAWARE STATE UNIVERSITY, *University, Dr. Mukti Rana Awarded a New Patent*, (Jul. 20, 2020), <https://www.desu.edu/news/2020/07/university-dr-mukti-rana-awarded-new-patent>.

aircrafts.⁷³ Further, in 2021, Dr. Deidre Quinn-Gorham of Tuskegee University received a patent for a multiple blade handle system for performing surgeries.⁷⁴ In 2023, Morgan State University received 13 patents.⁷⁵ This activity is significant because it showcases the potential of HBCUs to generate patent licensing revenue.

There is also evidence of academic entrepreneurship on some HBCU campuses. For example, the I-Corps Regional Node in New York's *New York City Regional Innovation Node* (NYCRIN) is led by City University of New York (CUNY) and was created in partnership with New York University (NYU) and Columbia University as a cooperative center connected to the national I-Corps innovation network.⁷⁶ NYCRIN builds on established technology development collaborations, venture capital investment resources, and NYC's fast-growing technology start-up environments.⁷⁷ Some faculty are engaging students, faculty and staff at HBCUs into entrepreneurship by using the NSF I-Corps curriculum.⁷⁸ There was a collaboration between the NYCRIN and the HBCUs North Carolina A&T State University, North Carolina Central University, and Winston-Salem State University.⁷⁹ This research team developed an NSF proposal "to examine the use of the I-Corps program and the Lean LaunchPad Methodology to foster entrepreneurial mindsets and produce innovations in HBCUs..."⁸⁰ Two entrepreneurial teams advanced from regional I-Corps course to national level and won \$50,000 to commercialize their products.⁸¹

In another I-Corps example, Dr. Sampson Addo, Dr. Pawan Tyagi and Dr. Devdas Shetty used the I-Corps Customer Discovery Process to interview 30 potential customers about Tyagi's and Shetty's patent for a pumpless solar

⁷³ Alexander Saunders, *N.C. A&T Patent Improves the Detection of Defects in Aircraft*, NORTH CAROLINA A&T NEWS, (Feb. 17, 2020), <https://www.ncat.edu/news/2020/02/patent-improves-aircraft-defects-detection.php>.

⁷⁴ HBCU Buzz, *Tuskegee University Veterinarian's Medical Device Lands Patent*, HBCU BUZZ, (Dec. 21, 2021), <https://hbcubuzz.com/74607/tuskegee-university-veterinarians-medical-device-lands-patent/>.

⁷⁵ JBHE, *Morgan State University Breaks HBCU Record for Patents Awarded in 2023*, J. BLACKS HIGHER EDUC. (Mar. 29, 2024), <https://jbhe.com/2024/03/morgan-state-university-breaks-hbcu-record-for-patents-awarded-in-2023/>.

⁷⁶ NSF, *Award Abstract # 1305023 I-Corps Node: New York City Regional Innovation Node (NYCRIN)*, NSF (2018), https://www.nsf.gov/awardsearch/showAward?AWD_ID=1305023.

⁷⁷ *Id.*

⁷⁸ Thaddeus McEwen, et al., *Applying a 'Mentor-Protégé' approach to broadening participation of HBCU's in the National Innovation Network*, 22 TECH. AND INNOVATION 359, 361 (2022).

⁷⁹ *Id.* at 361.

⁸⁰ *Id.* at 361.

⁸¹ *Id.* at 368.

thermal heater.⁸² Their customer discovery was a four-week course with 10 HBCU teams in the spring of 2021.⁸³ The interviews allowed them to “identify key challenges of potential end-users, validate some of [their] tested hypotheses, discover new health and environmentally related issues, and aided [them] to discover the market segment and early adopters....”⁸⁴

In May 2024, AUTM’s CEO Dr. Stephen Susalka responded to the U.S. Department of Commerce’s Patent and Trademark Office’s (USPTO) request for comments on how best to improve the ability to move more inventions from labs into marketplaces.⁸⁵ Refreshingly, Dr. Susalka mentioned the role HBCUs could play. Dr. Susalka wrote:

The integration of patenting processes into research and innovation at HBCUs will take a system level approach. HBCU leaders, starting with their presidents, should be part of Roundtable discussions with the USPTO where they will gain a clearer understanding of tech transfer, the patenting process, and how all this fits into the research and innovation agenda at their institutions. The key is to educate the administrators (presidents, deans, chairs, vice presidents for research, etc.) on the resources available, the best practices, and the value of engaging in the patenting process. This will encourage them to add innovation, entrepreneurship, and tech transfer into the strategic plan and vision for the university. If there is no leadership buy-in, it is difficult for tech transfer to be promoted and/or supported on the campus of HBCUs.⁸⁶

⁸² Sampson Addo & Pawan Tyagi *Promoting Technology Transfer of a Pumplless Solar Thermal Air Heater (Patent Number 10775058) Innovation Using the Customer Discovery Method in a Historically Black College and University (HBCU)*, Techconnect World Innovation Conference and Expo, (Oct., 2021); *see also* Pumplless solar energy based air heater and method, U.S. Patent No. 10,775,058 (filed Sept. 9, 2018).

⁸³ Addo & Tyagi, *supra* note 82.

⁸⁴ *Id.*

⁸⁵ Stephen J. Susalka, Response, *AUTM’s Comments in Response to the United States Patent and Trademark Office’s Request for Comments Titled “Unlocking the Full Potential of Intellectual Property by Translating More Innovation to the Marketplace”* (Docket No. PTO-C-2024-004), AUTM (2024),

<https://ipwatchdog.com/wp-content/uploads/2024/05/AUTM-comments.pdf>.

⁸⁶ *Id.*

In addition, Dr. Susalka recommends that HBCUs have USPTO experienced representatives on their campuses.⁸⁷ He also recommends that HBCUs have patent application assistance programs.⁸⁸ Also in May 2024, the National Science and Technology Council (NSTC) published seven recommendations for how federal research agencies could boost research capacity at HBCUs.⁸⁹ They recommended: (1) strengthening outreach and engagement activities; (2) providing comprehensive technical assistance and training; (3) increasing flexibility and expanding funding to support institutional capacity building; (4) demystifying the funding process; (5) combating bias in proposal reviews; (6) prioritizing transparency; and (7) facilitating effective and equitable partnerships.⁹⁰ The recommended partnerships include K-12, non-HBCU community colleges, non-profits, federal national labs, regional and national consortiums, and industry partners.⁹¹ In alignment with this recommendation, the remainder of Part II. B. provides a discussion of HBCUs' corporate, federal, non-profit and university partnerships.

1. Corporate Partners

Private corporations are encouraged to actively create diverse workforces by offering internships and by recruiting college students who are pursuing STEM degrees.⁹² There are several corporations that are partnering with HBCUs in supporting STEM education and research. For example, since 2014 Nissan has invested more than \$2.5 million in the Mississippi HBCU STEM Initiative to support and encourage innovative program development that serves

⁸⁷ *Id.*

⁸⁸ *Id.*

⁸⁹ NSTC, *Advancing Research Capacity at High Research Activity Historically Black Colleges and Universities*, NCJ Number 309105, National Science and Technology Council (NSTC), 14–22 (2024), <https://www.ojp.gov/library/publications/advancing-research-capacity-high-research-activity-historically-black-colleges>.

⁹⁰ *Id.*

⁹¹ *Id.* at 19; see Caroline Harper, *HBCUs, Black Women, and STEM Success*, HIGHER EDUC. TODAY, (May 14, 2018), regarding collaborating with K-12 partners. Harper cites the U.S.

Department of Education and U.S. White House during the Obama Administration. She states that for underrepresented minority students, the STEM pipeline is leaky. This is because only 33% of Black and 48% of Latino high schools have calculus and physics courses. The high schools for low-income and/or underrepresented minority students lack college and career level counseling that include adequate course selections, training on college admissions requirements, and experiential learning opportunities. Many of the Black students that want to go to college struggle to meet the math, science and general STEM expectations.

⁹² Harper, *supra* note 91.

Mississippi HBCU students.⁹³ The goal is to help build an inclusive tech workforce for the future.⁹⁴ And in 2017, Intel committed \$4.5 million in grants to six HBCUs over a three-year period.⁹⁵ The funds were to serve to keep African American students in STEM pathways.⁹⁶

In 2020, OLAY announced its ambitious mission to face the STEM gap by “doubling the number of women in STEM careers and tripling the number of women of color in STEM by 2030 by kicking off an initiative with a \$1 million commitment, and an initial \$500,000 donation [to] HBCUs to support women of color in pursuit of STEM careers.”⁹⁷ To this end, OLAY sent 1,200 girls to code camp with Black Girls CODE as part of a “#DecodetheBias campaign.”⁹⁸ Also in 2022, Ebony Magazine partnered with OLAY for a HBCU STEM Queens contest.⁹⁹ There was a competition in September 2021 to select the queens.¹⁰⁰ The goal was to celebrate talented female students in STEM fields HBCUs.¹⁰¹ To be considered, female STEM majors attending an HBCU had to submit their career goals and transcripts.¹⁰² The public voted on their favorite candidates online.¹⁰³ The top ten winners were featured in a February 2022 commemorative print issue.¹⁰⁴ This publication notes that Black women are the mothers of invention and are often “hidden figures” that must be seen.¹⁰⁵ This was an exciting initiative to highlight and support the achievements of Black women in STEM.

⁹³ NISSAN, *Nissan’s support of Mississippi HBCU STEM programs reaches \$2.5 million* (2024), <https://usa.nissannews.com/en-US/releases/nissans-support-of-mississippi-hbcu-stem-programs-reaches-25-million>.

⁹⁴ *Id.* (Seven HBCUs receiving a Nissan donation are Alcorn State University, Coahoma Community College, Hinds Community College - Utica Campus, Jackson State University, Mississippi Valley State University, Rust College and Tougaloo College).

⁹⁵ Sri Ravipati, *Intel Launches \$4.5 Million HBCU Grant Program to Keep African American Students in STEM*, CAMPUS TECHNOLOGY, (Jun. 29, 2017).

⁹⁶ *Id.*

⁹⁷ Ebony Magazine, *About the Olay HBCU STEM Queens*, EBONY MAGAZINE (2021), <https://www.ebony.com/olay-hbcu-stem-queens/>.

⁹⁸ *Id.*

⁹⁹ Tia Brown, *A SEAT AT THE TABLE Who’s got next? The winners of our OLAY x HBCU STEM Queens contest, of course! These 10 dynamic and beautiful minds are confirmation that the future is indeed young, Black, and female!*, EBONY MAGAZINE (2022), <https://www.ebony.com/magazine/hbcu-stem-queens/>.

¹⁰⁰ Woobox, *Ebony Olay HBCU STEM Queens Submission Form*, <https://woobox.com/wyj2mt> (last visited Dec. 13, 2025).

¹⁰¹ Ebony, *supra* note 97

¹⁰² Woobox, *Ebony Olay HBCU STEM Queens Submission Form*, <https://woobox.com/wyj2mt> (last visited Dec. 13, 2025).

¹⁰³ *Id.*

¹⁰⁴ Ebony, *Olay x EBONY HBCU STEM Queens*, <https://www.ebony.com/olay-hbcu-stem-queens/> (last accessed Dec. 13, 2025).

¹⁰⁵ Brown, *supra* note 99.

Since 2021, HP has sponsored the HP HBCU Tech Conference which focuses on forging successful tech careers.¹⁰⁶ In 2022, Capital One was named by the *US Black Engineer* magazine as one of “the Top 20 supporters of HBCU engineering schools.”¹⁰⁷ In addition, Walgreens partnered with the HBCU Connect news resource for diversity, equity and inclusion recruitment in areas such as software engineering and clinical trials.¹⁰⁸ Further, Benedict College partnered with Boeing for access to technology to improve their IT systems and computer labs.¹⁰⁹ And Virginia State University partnered with Verizon to reach middle school students to interest them in STEM careers to create a pipeline of STEM majors at Virginia State.¹¹⁰ Verizon financially supports a middle school technology summer camp program.¹¹¹

However, it is important to note that not all corporate partnerships work well. For example, April Curley, an African American Google employee, filed a class action lawsuit against Google in 2022 based on racial discrimination.¹¹² She was hired to recruit Black professionals for Google.¹¹³ Her legal complaint alleges that she and others were subjected to a racially hostile work environment including discriminatory pay, job assignments and advancement practices.¹¹⁴ Curley recruited 500 Black workers for Google before she was deemed to not be a good fit with the company.¹¹⁵ Early in 2025, Google ended some of its diversity recruiting programs.¹¹⁶

2. Federal partners

The U.S. federal government has grants and contracts set aside for HBCUs through several resources. For example, the U.S. Department of Education

¹⁰⁶ HP Inc., *HP's HBCU Tech Conference Returns With a Focus on Career Success*, 3BL MEDIA, (Sept. 13, 2022).

¹⁰⁷ CAPITAL ONE, *Investing in a more equitable future with HBCUs & HSIs*, Capital One (2022), <https://www.capitalone.com/commercial/insights/investing-in-hbcus-hsis/?msockid=25d2a9c327cd6b2a28ddbc4126296aaf>.

¹⁰⁸ *HBCU Connect is Proud to Announce its Renewed Partnership with Walgreens!*, HBCU CONNECT, (May 12, 2022); see also Sofia Montiel, *Walgreens - Celebrates black excellence in pharmacy!*, HBCU CONNECT, (Apr. 1, 2024).

¹⁰⁹ Zachary Brown, et al., *Presidents and their strategies to build partnerships at HBCUs*, SAMUEL DEWITT PROCTOR INST. FOR LEADERSHIP, EQUITY, & JUST., 8–9 (2021), https://proctor.gse.rutgers.edu/sites/default/files/MSIreportFeb21_R4.pdf.

¹¹⁰ *Id.* at 12.

¹¹¹ *Id.* at 12,14.

¹¹² Complaint at 2–3, *April Curley v. Google*, 5:22-cv-01735, (N.D. Cal. Mar. 3, 2022).

¹¹³ Clovia Hamilton, et. al., *Surpassing Bostock SEC Filing Deficits Mask Prevalence of LGBTQ+ Workplace Discrimination in Big Tech*, 26 MINN. J. L. SCI. & TECH. 124 (July 2025).

¹¹⁴ *Id.*; *Google*, 5:22-cv-01735, (U.S. District Court for the Northern District of California San Jose Division) 2–3.

¹¹⁵ Clovia Hamilton, et. al., *supra* note 113.

¹¹⁶ Michael Liedtke, *Google Scraps its Diversity Hiring Goals as it Complies with Trump's New Government Contractor Rules*, AP NEWS, (Feb. 5, 2025, 6:25 PM).

offers various grants and contracts specifically for HBCUs.¹¹⁷ In addition, the White House Initiative on HBCUs provides resources and support to help HBCUs access federal funding.¹¹⁸ They also offer guidance on developing proposals and working with federal agencies.¹¹⁹

The U.S. General Services Administration (GSA) supports HBCUs in becoming GSA Multiple Award Schedule (MAS) program contractors, which provides access to federal, state, and local government contract opportunities.¹²⁰ In addition, the U.S. Small Business Administration (SBA)'s "HUBZone program provides contracting assistance to small businesses located in economically distressed communities, referred to as Historically Underutilized Business Zones, or HUBZones, to promote job growth, capital investment and economic development in these areas, including Indian reservations."¹²¹ The HUBZone program offers contract set-asides for HBCUs located within qualified HUBZones.¹²² And the Biden-Harris Administration provided nearly \$100 million in grant opportunities for HBCUs, Tribal Colleges and Universities (TCCUs), and Minority-Serving Institutions (MSIs).¹²³ These grants aimed to expand research infrastructure and improve student outcomes at these institutions of higher education.¹²⁴

Further, the NSF has made substantial investments in HBCUs' R&D. For example, the NSF has supported the American Association for the Advancement of Science (AAAS)'s *Emerging Researchers Network* (ERN) Conference with a *HBCU Undergraduate Program* (HBCU-UP) program grant.¹²⁵ The ERN coincides with the AAAS's "HBCU Making & Innovation Showcase."¹²⁶ This is an HBCU student showcase of their hardware and software talent and innovations.¹²⁷ The 2018 showcase had speakers from the

¹¹⁷ Ivory A. Toldson & Amanda Washington, *How HBCUs Can Get Federal Sponsorship from the United States Department of Education*, 84 J. NEGRO EDUC. 1, 5–6.

¹¹⁸ *Id.*

¹¹⁹ *Id.*

¹²⁰ U.S. GEN. SERV. ADMIN. NEWS, *Assisting Historically Black Colleges and Universities (HBCUs) to Become GSA Multiple Award Schedule (MAS) Program Contractors*, (Sept. 17, 2021).

¹²¹ U.S. SMALL BUS. ADMIN., *Office of the Hubzone Program*, (2023), <https://www.sba.gov/about-sba/sba-locations/headquarters-offices/office-hubzone-program>.

¹²² U.S. GEN. SERV. ADMIN. NEWS, *Set-asides and special interest groups*, (May 6, 2024), <https://www.gsa.gov/small-business/register-your-business/explore-business-models/setasides-and-special-interest-groups>.

¹²³ U.S. DEP'T OF EDUC., *New Education Grant Programs for HBCUs, TCCUs, MSIs*, U.S. GOVERNMENT NEWS, (Aug. 1, 2023).

¹²⁴ *Id.*

¹²⁵ AAAS, *ERN Emerging Researchers National Conference in STEM - About NSF*, AAAS (2025), <https://emerging-researchers.org/about-the-nsf/>.

¹²⁶ *Id.*

¹²⁷ AAAS, *Showcase Summary*, American Association for the Advancement of Science (AAAS) (2018), available at <https://iie.aaas.org/services>.

U.S. Department of Education, U.S. Department of Commerce's Patent and Trademark Office (USPTO) and Minority Business Development Agency, NSF, and U.S. Forest Service.¹²⁸

In 2019, the AAAS HBCU Making and Innovation Showcase had speakers from the White House Initiative on HBCUs, NASA, and the USPTO.¹²⁹ In 2020, there were speakers from the U.S. Small Business Administration (SBA) and USPTO.¹³⁰ In 2021, there were federal agency representatives from the U.S. Department of Labor and SBA.¹³¹ In 2022, there were speakers from the U.S. National Institutes of Health, NSF, USPTO and SBA.¹³² In summary, it is important to note that the AAAS showcase has achieved consistent federal support over time.

Besides the HBCU-UP grant program, the NSF has several grant programs that HBCUs participate in. There is a *HBCU STEM Undergraduate Success* (STEM-US) research center grant program.¹³³ The goal of this program is to support STEM doctorate degrees,¹³⁴ one of the criteria essential for achieving R-1 and R-2 status.

There was a USPTO Patent and Trademark Resource Center (PTRC) established at the HBCU Howard University in 1986.¹³⁵ This was the only PTRC at a HBCU until October 2023 when the USPTO established PTRCs at Southern University, Prairie View University, and South Carolina State

¹²⁸ AAAS, *HBCU Making & Innovation Showcase*, AAAS (2018), https://static1.squarespace.com/static/5af4a0415cfd797f48e17653/t/5f22cf4ddabd57471fa25c5c/1596116814637/2018+Showcase_Agenda.pdf.

¹²⁹ AAAS, *HBCU Making & Innovation Showcase*, AAAS (2019), <https://static1.squarespace.com/static/5af4a0415cfd797f48e17653/t/5f22cab2bc954f32697e2adc/1596115634399/2019+HBCU+Making+%26+Innovation+Showcase+Agenda+.pdf>.

¹³⁰ AAAS, *HBCU Making & Innovation Showcase*, AAAS (2020), <https://static1.squarespace.com/static/5af4a0415cfd797f48e17653/t/5f22c6e3e446ee1c88f7eadd/1596114660689/2020+HBCU+Making+and+Innovation+Showcase+Agenda+FINAL+v1.pdf>.

¹³¹ AAAS, *HBCU Making & Innovation Showcase*, AAAS (2021), https://static1.squarespace.com/static/5af4a0415cfd797f48e17653/t/614c956c622c7d653b8b4323/1632408940304/showcase_agenda.pdf; see also Zaid Jilani, *2021 HBCU Making & Innovation Showcase Offers Opportunity for Students To Shine*, AAAS, (Dec. 8, 2021).

¹³² AAAS, *AAAS Making & Innovation Showcase*, AAAS (2022), <https://static1.squarespace.com/static/5af4a0415cfd797f48e17653/t/632bb2873d9eb176249f6b73/1663808136978/2022AAASHBCUMakerProgramFinal..pdf>.

¹³³ NSF, *NSF establishes new center to study successful undergraduate STEM education practices at historically Black colleges and universities*, NSF(2020), available at <https://new.nsf.gov/news/nsf-establishes-new-center-study-successful#:~:text=To%20study%20and%20model%20the%20successful%20practices%20of,o%20applying%20these%20practices%20broadly%20in%20higher%20education.>

¹³⁴ *Id.*

¹³⁵ USPTO, *USPTO empowers innovation among Black inventors and entrepreneurs by increasing the number of Patent and Trademark Resource Centers at HBCUs*, USPTO (Feb. 23, 2024), <https://www.uspto.gov/about-us/news-updates/uspto-empowers-innovation-among-black-inventors-and-entrepreneurs-increasing>.

University.¹³⁶ In addition, in May 2024, the NSF launched a \$1.2 million, 18-month long pilot to catalyze partnering between industry and emerging research institutes.¹³⁷ In August 2024, the NSF invested \$18.6 million in emerging research institutions to grow their networks and “capacity to participate in regional innovation ecosystems.”¹³⁸ The NSF also has an *Innovation through Institutional Integration* (I³) program.¹³⁹ In 2011, the NAS recommended that “one or more agencies can provide funding to an institution or group of institutions to better integrate activities focused on engaging minorities in STEM.”¹⁴⁰ NAS reported that the NSF’s I³ initiative illustrates this strategy.¹⁴¹ There is also the NSF *Growth and Repositioning of Academic Networks via Development and Training* (GRANTED) program.¹⁴² This initiative is aimed at strengthening the research support and service capacity at emerging and developing research institutions.¹⁴³ The emerging research institutions targeted include primarily undergraduate institutions and community colleges, institutions without the same opportunities as R1 and R2 institutions.¹⁴⁴ The program seeks to address systemic barriers within the research enterprise by providing funding and support to help these institutions develop meritorious ideas, stay updated on federal funding priorities, and manage grant submissions and awards.¹⁴⁵ By doing so, the NSF aims to broaden participation and ensure that talented researchers at these institutions can contribute to impactful scientific advances.¹⁴⁶

HBCUs are also promoting entrepreneurship education using the NSF *Center of Research Excellence in Science and Technology* (CREST) and NSF I-Corps program.¹⁴⁷ Since 2011, through experiential learning using a customer

¹³⁶ *Id.*

¹³⁷ NSF, *NSF invests in a pilot to catalyze partnerships between industry and researchers at emerging research institutions*, (May 22, 2024), <https://new.nsf.gov/tip/updates/nsf-halo-pilot>.

¹³⁸ NSF, *NSF invests \$18.6M in emerging research institutions to grow their networks and their capacity to participate in regional innovation ecosystems*, NSF (Aug. 29, 2024, 2:01 PM), <https://content.govdelivery.com/accounts/USNSF/bulletins/3b1d799#:~:text=The%20U.S.%20National%20Science%20Foundation%20announced%20a%20new,includng%20teams%20from%20historically%20Black%20colleges%20and%20universities>.

¹³⁹ NSF, *About I3*, (2018), <https://www.nsf-i3.org/about>.

¹⁴⁰ NAS, *EXPANDING UNDERREPRESENTED MINORITY PARTICIPATION: AMERICA’S SCIENCE AND TECHNOLOGY TALENT AT THE CROSSROADS*, 148 (2011).

¹⁴¹ *Id.*

¹⁴² Eleanor Johnson, *NSF 101: GRANTED*, NATIONAL SCIENCE FOUNDATION (NSF) (Nov. 9, 2023), <https://www.nsf.gov/science-matters/nsf-101-granted>.

¹⁴³ *Id.*

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ *Id.*

¹⁴⁷ Sampson Addo, et al., *Assessing awareness level of engineering graduate students about innovation commercialization at Historically Black Colleges and Universities*, 2022 ASEE

discovery process, the NSF I-Corps program has supported “teams of scientists and engineers to explore the commercial potential of technologies developed in university laboratories through a standardized entrepreneurial training program.”¹⁴⁸ In addition, NSF CREST Center awards aim to boost the research potential of MSIs by creating centers that effectively blend education and research.¹⁴⁹ These awards support generation of new knowledge, elevate the research productivity of individual faculty members, and increase the participation of students traditionally underrepresented in STEM fields.¹⁵⁰

The U.S. Department of Commerce’s Economic Development Agency (EDA) has also worked closely with HBCUs. Since 2012, \$2.1 million was invested in 15 projects.¹⁵¹ For example, Florida A&M University’s Entrepreneurship and Commercialization Hub was awarded EDA Regional Innovations Strategies funding.¹⁵² The EDA *i6 Challenge* is a national initiative to create centers for innovation and entrepreneurship.¹⁵³ The *i6 Challenge* awarded \$483,323 “to establish, strengthen, and connect technology proof of concept and commercialization programs, facilities and networks within the Tallahassee region.”¹⁵⁴

3. Non-profit partners

There are several partnerships between HBCUs and non-profits. Twelve (12) examples are described in Appendix B. The NAS has supported research on minority-serving institutions including HBCUs and has made several recommendations. A summary of their 2011 and 2019 study recommendations is provided in Appendix B. Other partnering non-profits include the Michelson Foundation, Innovate Alabama, Kentucky Commercialization Ventures, the University-Industry Demonstration Partnership (UIDP), Lumina Foundation, and VentureWell. In addition, there is the Emerging Research Institute Coalition (ERIC), Council on Government Relations (COGR), American Heart Association, Student Freedom Initiative, and Rutgers University’s Center for Minority Serving Institutes (CMSI).

Annual Conference & Exposition, Minneapolis (2022).

¹⁴⁸ NSF, *About I-Corps*, (2025), <https://www.nsf.gov/funding/initiatives/i-corps/about-i-corps>.

¹⁴⁹ NSF, *Centers of Research Excellence in Science and Technology (CREST Centers)*, (2025), <https://www.nsf.gov/funding/opportunities/crest-centers-centers-research-excellence-science-technology>.

¹⁵⁰ *Id.*

¹⁵¹ U.S. ECON. DEV. ADMIN., *Success Story: HBCU’s work to create wealth, builds healthy and sustainable communities*, (Feb. 1, 2018), <https://www.eda.gov/news/blogs/2018/02/01/success>.

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *Id.*

4. HBCU/Majority School partnerships

There are several partnerships between HBCUs and Majority Schools. Eighteen (18) are described in Appendix C. The partnering Majority Schools include Auburn University, Princeton University, University of Maryland, Purdue University, University of Kentucky, Columbia University, and University of Illinois in Chicago. In addition, there are nine NSF funded material research centers which are partnerships between HBCUs and Majority Schools. The nine Majority Schools include the University of Tennessee in Knoxville, University of Michigan, University of Wisconsin-Madison, University of California Santa Barbara, University of Pennsylvania, University of Texas at Austin, Northwestern University, the University of Washington, and the University of Illinois Urbana-Champaign.

In summary, there appear to be many partnerships, but AUTM STATT data between 1991 and 2023 showed a lack of reported technology transfer at emerging research institutions such as HBCUs, with the exception of four HBCUs.¹⁵⁵ Therefore, despite the number of partners, there seems to be no clear strategic plan for increasing HBCU involvement in tech transfer and revenue generation.

Further, the plethora of partnerships is difficult to navigate. And for HBCUs, there is also a trust issue. Scholar Chinwe Ohanele Agwu, Senior Program Manager at the Michelson Institute of Intellectual Property states that trust plays a critical role given the history of misappropriation of Black inventors' ideas.¹⁵⁶ This has resulted in a hesitancy in sharing ideas.¹⁵⁷ This is a pressing problem that needs closer attention.

For instance, given the lack of progress in some HBCUs, some experts have argued that HBCUs are no longer relevant and should close their doors.¹⁵⁸ HBCUs were primarily established as teaching institutions to address unequal access to education.¹⁵⁹ On one hand, African Americans have a rich history of

¹⁵⁵ AUTM, *supra* note 43.

¹⁵⁶ Chinwe Ohanele Agwu, *The HBCU IP Futures Collaborative Impact Report*, THE MICHELSON INST. FOR INTELL. PROP. 13 (2024), <https://cloviahamilton.com/wp-content/uploads/2025/07/hbcu-ip-futures-collaborative-impact-report.pdf>.

¹⁵⁷ *Id.*; see also Clovia Hamilton, *Black Americans past and present created frugal innovations and embraced circular economy principles: The marketing dilemma*, 11TH ANN. CONF. OF THE EUROMED ACAD. OF BUS. - MALTA. 593–603 (2018).

¹⁵⁸ John Michael Lee, Jr. & Samaad Wes Keys, *Repositioning HBCUs for the Future*, 25 (2013).

¹⁵⁹ Nia Imani Cantey, et al., *Historically Black Colleges and Universities: Sustaining a Culture of Excellence in the Twenty-First Century*, 17 J. AFR. AM., 143 (2013); see also Lorenzo L. Esters & Terrell L. Strayhorn, *Demystifying the Contributions of Public Land-Grant Historically Black Colleges and Universities: Voices of HBCU Presidents*, 64 NEGRO EDUC. REV. 119 (2013).

inventorship and innovation stemming from their adversity.¹⁶⁰ But, on the other hand, very few HBCUs are research oriented.¹⁶¹ These institutions have struggled to become more financially self-reliant.¹⁶² HBCUs are woefully behind because they were deliberately deprived of funds and resources,¹⁶³ but technology transfer offers the potential to generate revenue through patent licensing.

To discover more about HBCU faculty on a micro foundational level, a survey instrument was designed to uncover whether and how emerging research institution representatives compare their institution to established research institutions with respect to university technology transfer, academic entrepreneurship, industry partnerships and tech-based business ventures performance.

III. THEORY AND PROPOSITIONS

With regard to the comparison of emerging research institutions and established research institutions, the social comparison theory seems to be quite fitting. According to Leon Festinger, the need for comparisons to similar others leads to affiliation, pressure toward uniformity in groups, and a unidirectional drive upward that leads to competition.¹⁶⁴ Upward comparisons are with individuals or groups that are believed to be better, and downward comparisons are with those that are believed to be worse off.¹⁶⁵ If a group believes that their own abilities and efforts do not measure up, they may be motivated to make improvements.¹⁶⁶ The degree that positive or negative perceptions are developed in individuals and groups, is likely to depend on the comparison direction (i.e. upward, downward or horizontal).¹⁶⁷ The upward preference is most common and depends on factors such as whether the motive of self-

¹⁶⁰ Hamilton, *supra* note 157.

¹⁶¹ Hamilton, *supra* note 5; *see also* THE CARNEGIE CLASSIFICATION OF INST. OF HIGHER EDUC., IND. UNIV. CTR. FOR POSTSECONDARY RSCH. (CPR), <http://carnegieclassifications.iu.edu/>.

¹⁶² Monica G. Williams, *Increasing philanthropic support through entrepreneurial activities at Historically Black Colleges and Universities*, 10 INT'L J. OF EDUC. ADVANCEMENT, 216–17 (2010).

¹⁶³ Hamilton, *supra* note 5, at 5, 23–24 (“Industry wanted to train their future labor force. HBCUs were initially funded by wealthy northerners, aid societies and the Freedmen’s Bureau. This waned by 1873.” HBCUs have increasingly become dependent on U.S. federal and state funding.)

¹⁶⁴ Festinger, *supra* note 14.

¹⁶⁵ Abraham P. Buunk & Frederick X. Gibbons, *Social Comparison: The End of a Theory and the Emergence of a Weld*, 102 ORGANIZATIONAL BEHAV. AND HUM. DECISION PROCESSES, 6 (2007).

¹⁶⁶ Festinger, *supra* note 14.

¹⁶⁷ Kari Jeanne Visconti, et al., *Children's attributions for peer victimization: A social comparison approach*, 34 J. APPLIED DEVELOPMENTAL PSYCH., 277, 278. (2013).

improvement is more salient.¹⁶⁸ Both upward and downward directional social comparisons have a distinctive impact on employee attitudes and behavior.¹⁶⁹

The social comparison theory focuses on the way people evaluate their own ability or opinions by comparing themselves with others.¹⁷⁰ Applying the social comparison framework, this study assesses how emerging research institution representatives compare their institution to established research institutions. In addition, this study used a stated-choice survey about university technology transfer to predict emerging research institution representatives' choice behavior. The survey instrument was designed to investigate the perceptions of emerging research institution representatives regarding the level and extent of sponsored research, technology transfer, and business ventures involving industry partnerships at emerging research institutions in comparison to established research colleges and universities.

There are three (3) primary lessons from the social comparison theory:

1. Emerging research institutions should be compared to established research institutions of similar ability and geographic location. With respect to the social comparison of ability, individuals compare themselves with others that have similar abilities.¹⁷¹ This comparison allows them to lessen their uncertainty and enhance or preserve their self-esteem.¹⁷² These comparisons are based on others who are in close physical proximity "because such individuals are likely to be similar in key ways."¹⁷³ Thus, physical geographic location matters.
2. Competition, cooperation and conforming are social evaluation strategies related to social rules for distributing rewards, and competitive social comparison is greatest when the comparer and other person are similar in ability.¹⁷⁴
3. Any comparison needs to be specific with objectively measurable attributes to diminish bias.¹⁷⁵

¹⁶⁸ Buunk, *supra* note 165.

¹⁶⁹ Douglas J. Brown, et al., *Antecedents and consequences of the frequency of upward and downward social comparisons at work*, 102 ORGANIZATIONAL BEHAV. AND HUM. DECISION PROCESSES 59, 59 (2002).

¹⁷⁰ Festinger, *supra* note 14.

¹⁷¹ *Id.*

¹⁷² Jerald Greenberg, et al., *Social comparison processes in organizations*, 102 ORGANIZATIONAL BEHAV. AND HUM. DECISION PROCESSES 22, 29 (2007).

¹⁷³ *Id.*

¹⁷⁴ A. Stephen Dakin & John Arrowood, *The Social Comparison of Ability*, 34 HUM. REL. 89, 94–95 (1981).

¹⁷⁵ Scott T. Allison, et al., *On being better but not smarter than others: The Muhammad Ali effect*, 7 SOC. COGNITION 275, 277 (1989).

Based on the literature review and evidence of numerous federal, corporate and non-profit partnerships and support programs that encourage emerging research institutions like HBCUs to increase their engagement in technological innovations, STEM research, technology transfer and academic entrepreneurship, the following three propositions were drafted for testing.

Proposition 1. It is proposed that emerging research institution representatives often compare their emerging research institution employer's research, technology commercialization and academic entrepreneurship performance to established research institutions' research, technology commercialization and academic entrepreneurship performance.

Proposition 2. It is proposed that emerging research institution representatives seek out the opinions of representatives at established research institutions regarding research, technology commercialization, and academic entrepreneurship.

Proposition 3. It is proposed that emerging research institution representatives compare their institution's procedures for research, technology commercialization, and academic entrepreneurship to the procedures of established research institutions.

Next, Part IV. describes the survey method used in this study to test these propositions. The survey assesses social comparisons made by emerging research institution representatives. The survey participants included faculty and administrators at HBCUs in STEM fields. Data collected from the established research institutions is important for the purpose of comparing their responses to the emerging research institution respondents.

IV. METHODOLOGY

Survey instruments can be used in experiments for data collection. Stated-choice surveys are used for eliciting the preferential choices of survey respondents.¹⁷⁶ Stated-choice surveys are used, for example, by economists and social scientists to estimate the demand for new products that have new attributes and features.¹⁷⁷ Preferences, choices, attributes, and decision-making

¹⁷⁶ JORDAN J. LOUVIERE, ET AL., STATED CHOICE METHODS ANALYSIS AND APPLICATIONS, 1–2 (Cambridge University Press eds., 2000).

¹⁷⁷ See generally Michiel C. J. Bliemer & John M. Rose, *Designing and Conducting Stated Choice Experiments*, in *Handbook of Choice Modelling* 172, 172–76 (Stephane Hess & Andrew Daly eds., Edward Elgar Publ'g 2024).

units can be measured.¹⁷⁸ Without this data, managers merely guess what the market response is to new products. Thus, stated-choice methods are used to model consumer preferences.¹⁷⁹

In stated-choice surveys, factors and levels are key components used to design the choice tasks presented to respondents.¹⁸⁰ Factors are the attributes or characteristics of the alternatives that respondents are asked to choose between.¹⁸¹ For example, in a transportation survey, travel time, gas costs and comfort are factors that are important to drivers. Levels are the specific values or categories that each factor can take.¹⁸² For instance, for the travel time factor, its levels might be 30 minutes, 45 minutes, and 60 minutes. By varying the levels of these factors across different choice tasks, researchers can understand how respondents value different attributes and make trade-offs between them.

This study uses social comparison theory to investigate the phenomenon of emerging research institutions being woefully behind established research institutions in technology commercialization.¹⁸³ The first step in helping emerging research institutions achieve financial stability is to study the perceptions of emerging research institution representatives and how they compare themselves to other established research institutions of higher education.

The Iowa-Netherlands Comparison Orientation (INCOM) scale for Social Comparison Orientation was used as a conceptual guide for the survey questions.¹⁸⁴ Here is the INCOM response scale and questions:

Response scale for all items:

1. I disagree strongly
2. I disagree
3. I neither agree nor disagree
4. I agree
5. I agree strongly

¹⁷⁸ Garcia-Diaz, *supra* note 4.

¹⁷⁹ *Id.*

¹⁸⁰ Bliemer & Rose, *supra* note 177.

¹⁸¹ *Id.*

¹⁸² *Id.*

¹⁸³ Hamilton, *supra* note 5.

¹⁸⁴ Frederick X. Gibbons & Bram P. Buunk, *Individual Differences in Social Comparison: Development of a Scale of Social Comparison Orientation*, 76 J. PERSONALITY AND SOC. PSYCH. (1999); *see also* Abraham P. Buunk & Frederick X. Gibbons, *Social comparison orientation: a new perspective on those who do and those who don't compare with others*, SOC. COMPARISON AND SOC. PSYCHOLOGY: UNDERSTANDING COGNITION, INTERGROUP RELATIONS AND CULTURE (Serge Guimond ed. 2006); *see also* Bram P. Buunk, et al., *Diferencias individuadas en la comparación social: Propiedades de la Escala Española de Orientación hacia la Comparación Social [Individual differences on social comparison: Properties of the Orientation Spanish Scale towards Social Comparison]*, 37 REVISTA LATINOAMERICANA DE PSICOLOGÍA 561, 561 (2005).

Recode: items 6 en 10

Short version: items 1, 3, 4, 6, 7, 11

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with those of other people. There is nothing particularly “good” or “bad” about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with other people. To do that we would like to ask you to indicate how much you agree with each statement below.

1. I often compare myself with others with respect to what I have accomplished in life.
2. If I want to learn more about something, I try to find out what others think about it.
3. I always pay a lot of attention to how I do things compared with how others do things.
4. I often compare how my loved ones (boy or girlfriend, family members, etc.) are doing with how others are doing.
5. I always like to know what others in a similar situation would do.
6. I am not the type of person who compares often with others.
7. If I want to find out how well I have done something, I compare what I have done with how others have done.
8. I often try to find out what others think about who face similar problems as I face.
9. I often like to talk with others about mutual opinions and experiences.
10. I never consider my situation in life relative to that of other people.
11. I often compare how I am doing socially (e.g., social skills, popularity) with other people.

The attributes and options that were identified for the stated-choice survey questionnaire used in this study follow the INCOM social comparison orientation.¹⁸⁵ However, instead of a five (5) point Likert scale, a seven (7) point

¹⁸⁵ Frederick X. Gibbons & Bram P. Buunk, *Individual Differences in Social Comparison: Development of a Scale of Social Comparison Orientation*, 76 J. PERSONALITY AND SOC. PSYC. (1999); see also Abraham P. Buunk & Frederick X. Gibbons, *Social comparison orientation: a new perspective on those who do and those who don't compare with others*, SOC. COMPARISON AND SOC. PSYCHOLOGY: UNDERSTANDING COGNITION, INTERGROUP RELATIONS AND CULTURE (Serge Guimond ed. 2006); see also Abraham P. Buunk, et al., *Diferencias individuales*

listing of attributes was chosen because the 7-point scale is one of the most common and widely used instruments in measuring opinions, beliefs, and attitudes.¹⁸⁶

The survey design was divided into four (4) steps. The first step was to define the attributes. Ten (10) social comparisons were identified and defined as attributes or factors. The second step was the determination of choices or options to be included in the survey regarding social comparisons. Seven (7) options were selected. Respondents were asked:

Thinking specifically about the accomplishments of the HBCU you work for in its **acquisition of government and industry sponsored research funding**, how often do you:

1. Compare the institution you work for with majority schools.
2. Try to find out what majority schools think about your institution.
3. Pay attention to how the institution that you work for does things compared to how majority schools do things.
4. Compare how the institution you work for is doing with how majority schools are doing.
5. Like to know what majority schools in a similar situation would do.
6. Compare how the institution you work for has done something with how majority schools have done it.
7. Try to find out what majority school representatives think who face similar problems to those your institution faces.
8. Compare your work in the institution that you work for to individuals doing similar work from majority schools.
9. Talk with majority school representatives about mutual opinions and experiences.
10. Consider the institution you work for in relation to that of majority schools.

Identification of **options** involved identifying relevant ways that the HBCU STEM faculty would compare their HBCU employer to majority schools (aka established research institutions). As follows, selected options include the level

en la comparación social: Propiedades de la Escala Española de Orientación hacia la Comparación Social [Individual differences on social comparison: Properties of the Orientation Spanish Scale towards Social Comparison]. 37 REVISTA LATINOAMERICANA DE PSICOLOGÍA 561, 561 (2005).

¹⁸⁶ ROBERT F. DEVELLIS & CAROLYN T. THORPE, SCALE DEVELOPMENT: THEORY AND APPLICATIONS, 112 (Sage Publications 2022).

and extent to which the emerging research institution representatives agree or disagree with various social comparisons:

1. Never
2. Very rarely (<10% of the time)
3. Fairly rarely (10-25% of the time)
4. Sometimes (about 25-50% of the time)
5. Frequently (about 50-75% of the time)
6. Very frequently (about 75-99% of the time)
7. Always

This questioning was repeated with the following three additional sets of questions regarding the accomplishments of the HBCU in technology commercialization efforts, partnerships between academia and industry, and acquisitions of new business ventures. See the survey instrument in Appendix D. Note that there is a shortcoming. The line of questioning does not hone into a comparison between HBCUs and specific well-established research institutions of similar geographic locations, similar size and abilities. While doing so would have been in alignment with lessons learned about the social comparison theory, this would have made the survey much more complex and would likely confuse respondents. But this would be an interesting topic for a finer-grained future study.

The target population for the survey was HBCU STEM faculty and administrators who were at least 18 years of age or older and residents of the U.S.

Survey instrument: The principal investigator developed an initial draft of the survey instrument and the Indiana University Institutional Review Board (IRB) reviewed and determined the survey instrument to be exempt. The approved draft was provided to the Indiana University Center for Survey Research (CSR) in March 2024 and refined through multiple rounds of feedback and revision. Clarifiers were added to the response scales, and a series of demographic questions and three open-ended text items were included for a total of 55 items in the final questionnaire. The questionnaire was administered in English only. Appendix D contains the full text of the questionnaire. The

questionnaire was programmed in Qualtrics survey software by CSR and rigorously tested for alignment to the questionnaire specifications.¹⁸⁷

Sample: An initial list sample of STEM professors and administrators (n=2,317) at 24 doctoral HBCUs was provided to CSR in an Excel file, consisting of their names, email addresses, affiliated institutions, titles, and fields of study. The principal investigator created this sample with the goal of listing every STEM professor at the 24 doctoral HBCUs by reviewing and accumulating the necessary information from each institution's website. STEM administrators such as lab staff, department heads, program directors, and Deans were also solicited. The CSR team checked the sample file for duplicates, empty fields, and invalid email addresses using human reviewers and SQL queries. The sample list was adjusted accordingly.

Once the list sample was finalized, unique CSR sample identifiers (samIDs) and Qualtrics identifiers (surveyIDs) were assigned to each sample unit for email campaign and survey tracking purposes. During data collection, additional HBCU STEM professors (n=4) were recommended by peers already in the sample and they were added to the list. A week before the end of data collection, a list sample of University of the District of Columbia STEM professors and administrators (n=32) was provided to CSR by the principal investigator, and the same sample cleaning and processing procedures were applied.

Given the estimated total population size (n≈2,400, based on the sample list prepared by the principal investigator), CSR calculated the minimum number of respondents needed for a 5% margin of error at an 80% confidence level to be 154 respondents using Raosoft's sample size calculator.¹⁸⁸

To obtain the required number of respondents, all email addresses from the original sample file and sample lists that were added during data collection were included in the study (n=2,353) and there was no sampling.

Recruitment messages: Participants were recruited using a tailored email campaign strategy which included a prenotification email, survey invitation, and four reminder emails developed by CSR in collaboration with the principal investigator. Newly suggested sample participants introduced in late May received three reminders rather than four, and the University of District of Columbia sample fielded in early June received only the prenotification email and survey invitation. The campaigns were sent by CSR on behalf of the researcher. CSR and the principal investigator also provided respondent support

¹⁸⁷ QUALTRICS, *Qualtrics Survey Software*, <https://www.qualtrics.com> (last visited Dec. 13, 2025).

¹⁸⁸ RAOSOFT SAMPLE SIZE CALCULATOR (2025), <http://www.raosoft.com/samplesize.html>.

as needed via email. Some respondents who were added to the sample later or who initially provided only a partial response received slightly modified campaign messages. There were no incentives offered to participants.

Data collection: Data was collected via personalized Qualtrics survey links emailed to respondents. The field period for the survey was May 10, 2024, through June 12, 2024, and data collection was administered by CSR. The survey instrument was modified once during data collection to reflect the addition of University of the District of Columbia STEM professors and STEM administrators to the sample. This brought the total number of HBCUs to 25. After removing 34 break-off responses that did not contain enough data to be considered a partial complete, the survey resulted in 275 complete and no partial complete responses.

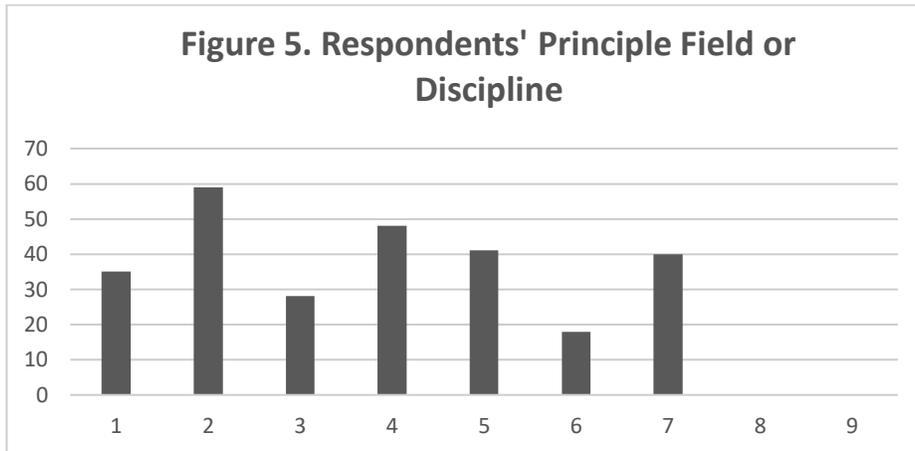
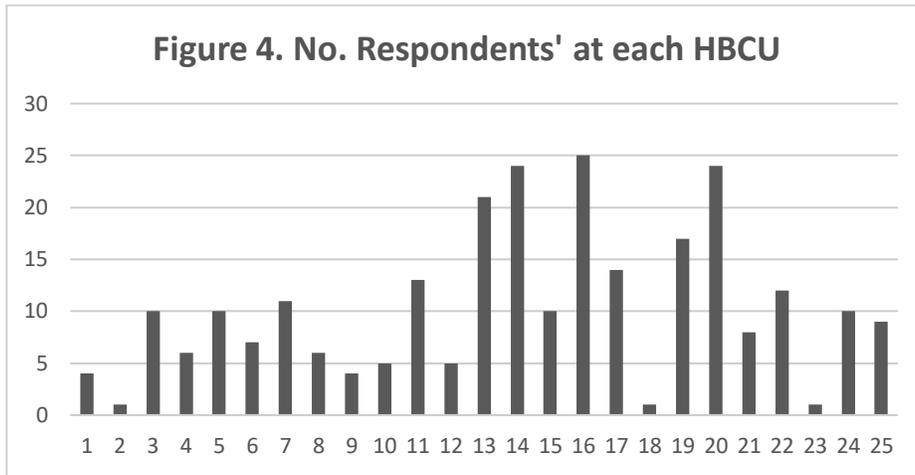
V. FINDINGS

A. Demographics

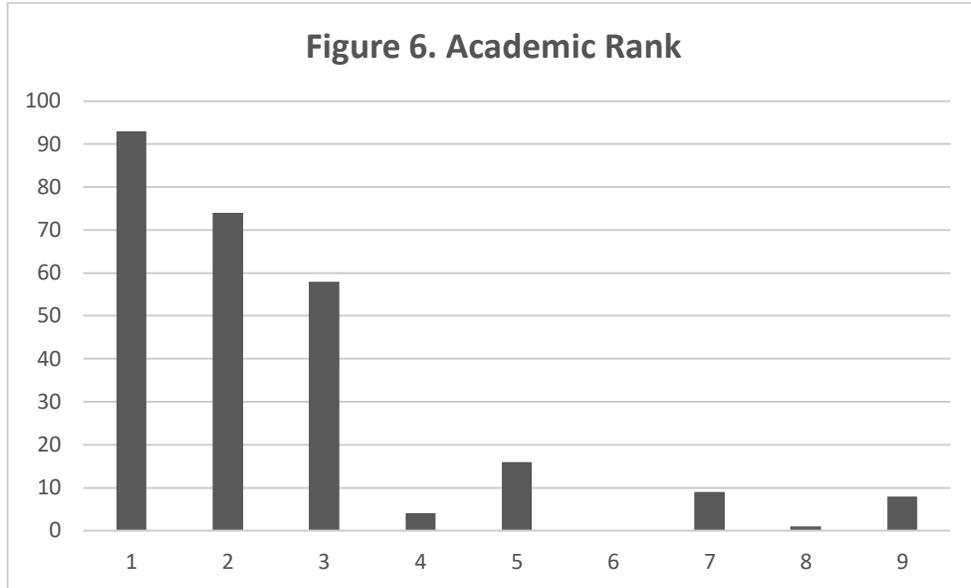
Figures 4 through 12 provide demographic information about the survey respondents' HBCU employers, disciplines, academic rank, tenure status, highest level of education, race, place of birth, age and gender identity. The following list of HBCUs are numbered to correspond with the x-axis numbering in Figure 4:

1. Alabama A&M University
2. Alabama State University
3. Bowie State University
4. Clark Atlanta University
5. Delaware State University
6. Fayetteville State University
7. Florida A&M University
8. Grambling State University
9. Hampton University
10. Howard University
11. Jackson State University
12. Meharry Medical College
13. Morehouse School of Medicine
14. Morgan State University
15. Norfolk State University
16. North Carolina A&T State University
17. Prairie View A&M University
18. South Carolina State University
19. Southern University and A&M College

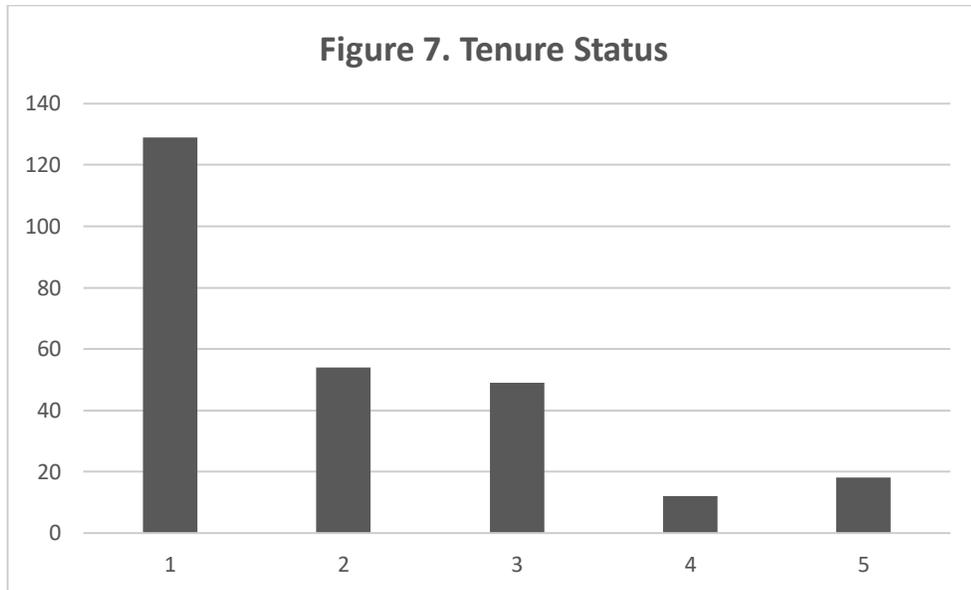
- 20. Tennessee State University
- 21. Texas Southern University
- 22. Tuskegee University
- 23. University of the District of Columbia
- 24. University of Maryland Eastern Shore
- 25. Virginia State University



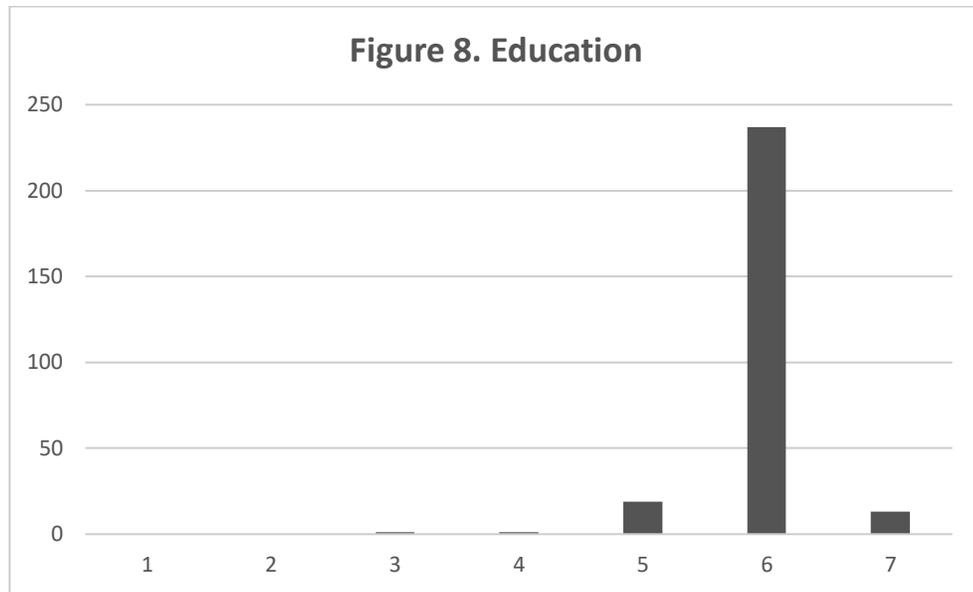
Legend: (1) Agriculture/Natural Resources, (2) Biological/ Biomed, (3) Computer/ Info Science, (4) Engineering, (5) Health Profession, (6) Math/Statistics, (7) Physical Science, (8) Psychology, (9) Other



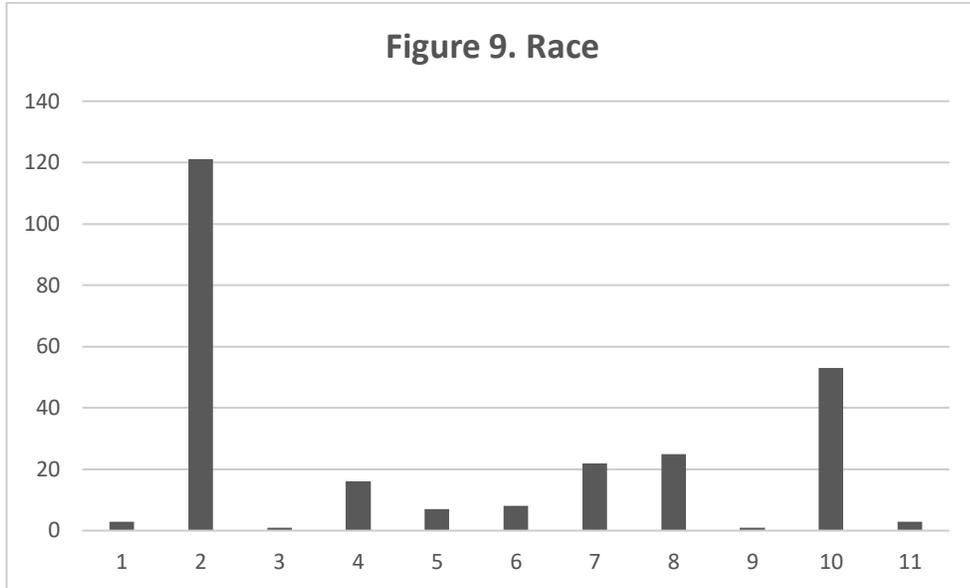
Legend: (1) Professor, (2) Associate Professor, (3) Assistant Professor, (4) Instructor, (5) Lecturer, (6) Postdoc, (7) Adjunct Faculty, (8) Visiting Faculty, (9) Researcher



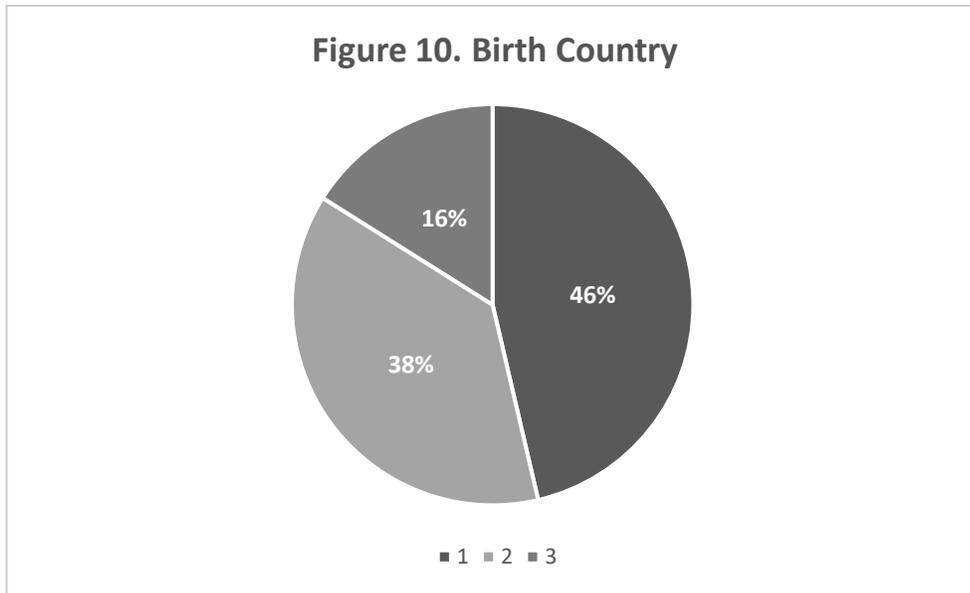
Legend: (1) Tenured, (2) On tenure track but not tenured, (3) Not on the tenure track, (4) No tenure system for my faculty status, (5) No tenure system at this institution



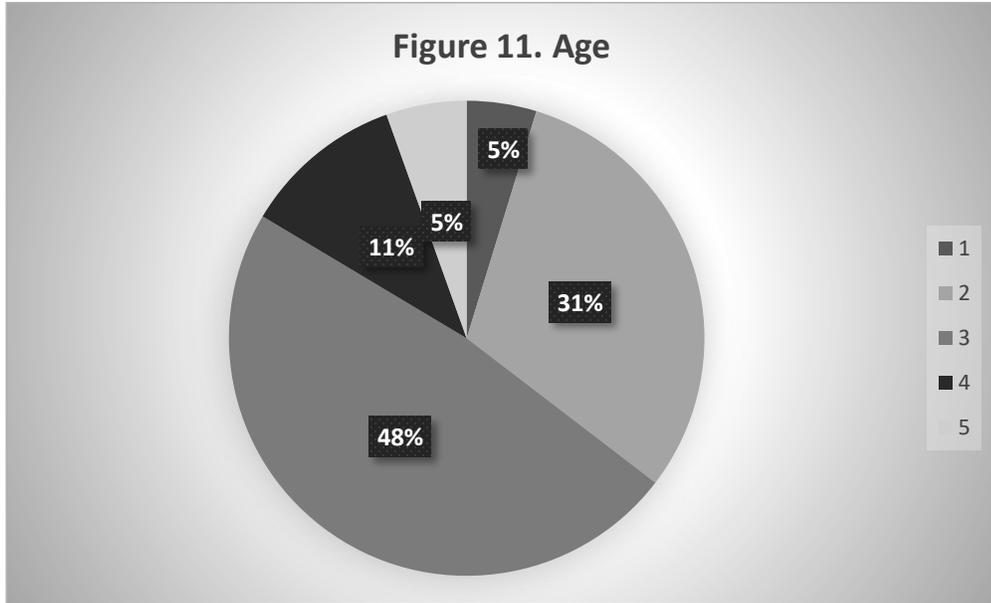
Legend: (1) Some college or less, (2) Technical certification, (3) Associate's degree, (4) Bachelor's degree, (5) Master's degree, (6) Doctorate (PhD, EdD), (7) Professional degree (JD, MD, DDS)



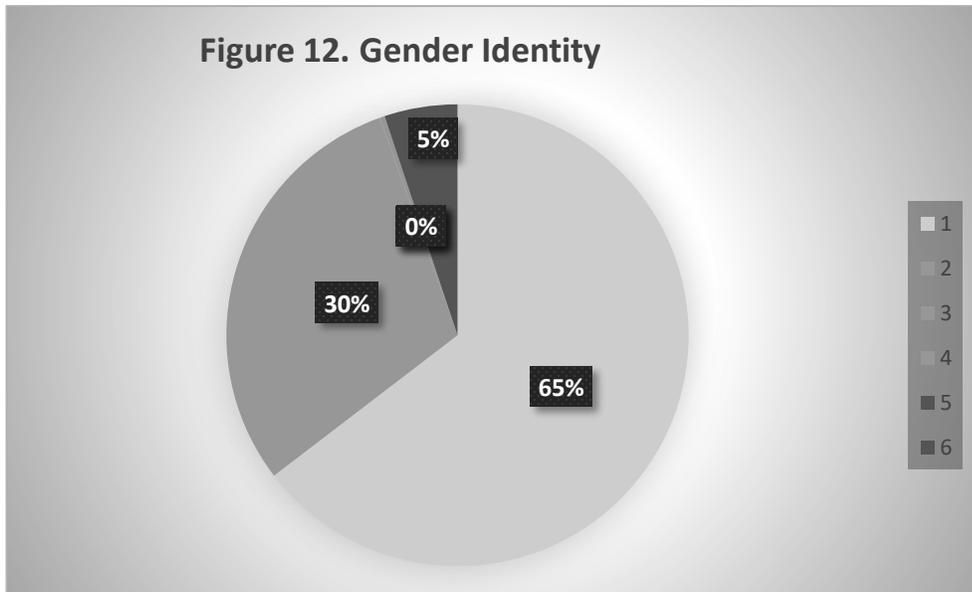
Legend: (1) American Indian or Alaska Native, (2) Black or African American, (3) North African, (4) African, (5) Middle Eastern, (6) Hispanic, (7) East Asian, (8) South Asian, (9) Native Hawaiian or Other Pacific Islander, (10) White, (11) Other



Legend: (1) United States, (2) Outside the United States, (3) Prefer not to answer



Legend: (1) 18-34, (2) 35-49, (3) 50-69, (4) 70+, (5) Prefer not to answer



Legend: (1) Man, (2) Woman, (3) Nonbinary, gender nonconforming, or gender fluid, (4) Transgender, (5) Prefer a different term, (6) Prefer not to answer

As shown in Figure 4, there were respondents from each HBCU included in the study. The highest number of survey respondents were employed at North Carolina A&T, Morgan State, Morehouse School of Medicine, and Tennessee State University. Figure 5 shows that the top four disciplines for the respondents are biological/ biomedical sciences, engineering, health, and physical sciences. Figure 6 shows that most of the respondents are full professors, followed by associate and assistant professors. This aligns with Figure 7, which shows that most of the survey participants are tenured professors.

Figure 8 shows that most of the respondents have earned doctorate degrees. Figure 9 provides evidence that most identify as Black or African American. The next highest race is White. Figure 10 shows that forty-six (46%) percent of the respondents were born in the U.S., 38% were born outside the U.S. and 16% preferred not to answer. As shown in Figure 11, 48% of the respondents are in the age range of 50-69. Finally, Figure 12 shows that 65% of the survey participants identified as men, 30% as women and 5% preferred not to answer.

B. Technology Transfer

For each of the 40 questions, the median, most frequently chosen values are provided in Tables 2 through 5 in Appendix D. The most frequently chosen response for most of the questions regarding whether respondents compared their HBCU to majority schools was “sometimes” (about 25-50% of the time). Thus, albeit at the low end of the spectrum, there are some comparisons taking place consistently in all of the following four study areas:

1. acquisition of government and industry sponsored research,
2. commercialization efforts,
3. partnerships between academia and industry, and
4. acquisitions of new business ventures.

There was one question with a most frequently chosen score of 5: “Thinking specifically about the accomplishments of the HBCU you work for in its acquisition of government and industry sponsored research funding, how often do you pay attention to how the institution that you work for does things compared to how majority schools do things.” A score of 5 indicates that survey participants frequently (about 50-75% of the time) compare the procedures used by their institution to procedures used by majority institutions to acquire funding.

A score of 3 corresponds to fairly rare social comparison (about 10-25% of the time). Out of the 40 questions, the survey respondents’ most frequent response was a score of 3 on the following nine questions:

1. Thinking specifically about the accomplishments of the HBCU you work for in its **acquisition of government and industry sponsored research funding**, how often do you try to find out what majority schools think about your institution?
2. Thinking specifically about the accomplishments of the HBCU you work for in its **technology commercialization** efforts, how often do you try to find out what majority schools think about your institution?
3. Thinking specifically about the accomplishments of the HBCU you work for in its **technology commercialization** efforts, how often do you try to find out what majority school representatives think who face similar problems to those your institution faces?
4. Thinking specifically about the accomplishments of the HBCU you work for in its **technology commercialization** efforts, how often do you talk with majority school representatives about mutual opinions and experiences?
5. Thinking specifically about the accomplishments of the HBCU you work for in its **partnerships between academia and industry**, how often do you try to find out what majority schools think about your institution?
6. Thinking specifically about the accomplishments of the HBCU you work for in its **partnerships between academia and industry**, how often do you talk with majority school representatives about mutual opinions and experiences?
7. Thinking specifically about the accomplishments of the HBCU you work for in its **acquisition of new business ventures**, how often do you try to find out what majority schools think about your institution?
8. Thinking specifically about the accomplishments of the HBCU you work for in its **acquisition of new business ventures**, how often do you try to find out what majority school representatives think who face similar problems to those your institution faces?
9. Thinking specifically about the accomplishments of the HBCU you work for in its **acquisition of new business ventures**, how often do you talk with majority school representatives about mutual opinions and experiences?

In the survey instrument, technology transfer was explained as:

“University technology transfer occurs when a faculty member develops an invention using university resources (labor, equipment, facilities) and gets it evaluated for patentability and marketability. The goal is to market the invention, license or sell it and collect revenues.”

Respondents were asked to choose whether technology transfer was a priority at their university or not. The median choice was that it was not a priority.

In addition, there was an open-ended question. Respondents were asked if they had any direct dealing with technology transfer at their HBCU. There were 48 responses among the 245 respondents. Here is a summary of these statements:

- Several expressed negative experiences.
- Fourteen stated that they received assistance.
- Seven responded in a manner that indicated that they did not understand the meaning of university technology transfer as it was explained in the survey instrument.
- Three stated that they received at least one patent.
- Two mentioned getting assistance with material transfer agreements.¹⁸⁹
- Two stated that they had worked with majority schools in the past.

Among the individuals that did not seem to understand the explanation of what university technology transfer entails, they mentioned using classroom technology, updating their curriculum, and being involved in technology

¹⁸⁹ See AUTM, *Material Transfer Agreements (MTAs) in Research*, AUTM (2025), available at <https://autm.net/surveys-and-tools/agreements/material-transfer-agreements>. Material transfer agreements are:

a contract that governs the transfer of materials between institutions for use in research. Materials may include cell lines, plasmids, nucleotides, proteins, transgenic animals, plant varieties, bacteria, pharmaceuticals and other chemicals. These agreements...also may limit the use and further dissemination of the material by the recipient, address publication rights and confidentiality as well as rights to inventions and research results.

upgrades. One mentioned training agricultural growers and three reported on the research investigations they were involved in.

The individuals that expressed having negative experiences with technology transfer gave insightful responses. Two mentioned not getting clear information on the technology transfer process at their HBCU. With regard to university technology transfer office (TTO) staffing, one respondent stated that their TTO representative left their HBCU and left their invention disclosure vulnerable. Two respondents stated that there was no TTO, system, or people. One respondent stated that their TTO focused on marketing technology but not on protecting faculty's intellectual property. Six respondents stated that they encountered challenges with support, including time delays and slow responsiveness. Two respondents mentioned that there is a willingness to pursue technology transfer, but their HBCU lacked resources. One stated that their HBCU recently hired a TTO representative.

There were additional concerns. One respondent stated that their HBCU was slow to resolve issues, even minor issues, that they had faced over some time. One survey respondent stated that, as their university moved toward gaining R-1 status, they would need to change as a university and provide technology transfer services. Regarding whether technology transfer was a priority for his or her HBCU, one respondent wrote "it's not a priority but that doesn't mean it's not important to me."

One respondent stated that as a busy faculty member, their schedule was too hectic to follow through on an invention disclosure. Another individual expressed being engaged in basic research only. Relatedly, one respondent indicated opposition to technology transfer altogether. This individual stated, "I am quite opposed to the entire idea of the university acting as a tool to transfer technology to private industry. This process turns the university into a tool for private interests instead of an engine for the objective determination of scientific truth."

C. Academic Entrepreneurship

Academic entrepreneurship was explained as:

"Academic entrepreneurship involves the creation of a startup business that markets an invention developed by a faculty member."

The median response was that academic entrepreneurship was not a priority for their HBCUs.

There was also an open-ended question. Respondents were asked if they had any direct dealing with academic entrepreneurship at their university.

Positive responses included:

- It is encouraged that we try to develop and/or take part in research centers.
- The people at the helm of my institution (especially the President) are very much for developing startup businesses for students.
- My office funds an effort to assist faculty in the submission of patent applications.
- Yes. It will become important in a few years.
- I will be involved in [the] future.
- [There is d]evelopment of an entrepreneurship incubator center.
- Yes, I started my own business leveraging hemp materials and products.
- [The HBCU is d]esigning special courses for seniors and graduates.
- Yes, [I] was invited to showcase my entrepreneur ideas work via a poster...
- Yes--we provide entrepreneurship mentorship.
- I wrote and received a grant from the U.S. Dept. of Commerce Economic Development Administration.
- The College of Business offers degree programs in entrepreneurship.
- Regularly report on inventions, patents, copyrights including dollars earned.
- ...there is a focus on Student Entrepreneurship engagement.
- Developed a meditation procedure that could be developed into a business.
- Yes, [a] colleague and I formed a startup to develop a product for reducing inflammation associated with Sickle Cell Disease (SCD).

Negative sentiments included:

- I would say the University is interested but it is not prioritized....there is no official information or official guidelines available to provide the necessary procedural help.
- Crab in a bucket, competitive culture among faculty. Selected individuals are encouraged and rewarded with opportunities.
- No feedback.

- No direct dealings with academic entrepreneurship, because I have not been able to even get an invention disclosure successfully processed to be able to move to such a step. It is very frustrating, because I feel my institution is missing opportunities for additional income resources that are not being pursued.
- We have a very high workload and entrepreneurship is desired but not promoted or incentivized. It is always celebrated after the fact.
- This is not encouraged in my university.
- I am entirely opposed to the idea that academicians should be “entrepreneurs”. This has the effect of biasing research efforts towards things that can potentially generate profit, as opposed to research that objectively seeks to provide improvement in the human condition. This is particularly problematic in the HBCU context, as we were founded to meet the needed of underserved racialized persons, not to buttress the capitalist institutions that are the source of their oppression.
- The school...still hasn’t defined how to go about charging for services and as a result there is a lot of flexibility.
- Academic entrepreneurship is a priority in our institution but the resources are still limited and also institutional coordination and support are not strong enough.
- My only experience with academic entrepreneurship involved my authorship of a laboratory manual that would be purchased by students in my lab class.

VI. DISCUSSION

In applying the social comparison theory, upward comparisons are with individuals or groups that are believed to be better, and downward comparisons are with those that are believed to be worse off.¹⁹⁰ If a group believes that their own abilities and efforts do not measure up, they may be motivated to make improvements.¹⁹¹ Based on the most frequent response, the HBCU STEM faculty indicated they compared their HBCU to majority schools was “sometimes” (about 25-50% of the time). Thus, albeit at the low end of the spectrum, there are some comparisons taking place consistently in all of the following four study areas:

¹⁹⁰ Festinger, *supra* note 14.

¹⁹¹ *Id.*

1. Acquisition of government and industry sponsored research,
2. commercialization efforts,
3. partnerships between academia and industry, and
4. acquisitions of new business ventures.

Therefore, in applying the social comparison theory, although the most frequent responses are that technology transfer and academic entrepreneurship are not priorities, these HBCU STEM faculty members may be motivated to make improvements. From the open-ended questions, we have some evidence of whether the respondents believe that their HBCU employers are measuring up to the emerging research institutions. The negative responses identifying problem areas at the HBCUs are evidence of areas that need improvement. These are important findings because why continue with the push to increase HBCU technology transfer if there is no motivation to engage in this arena?

The phenomenon that HBCUs are not prioritizing technology transfer and academic entrepreneurship is not new. For example, Chinwe Ohanele Agwu, Senior Program Manager at the Michelson Institute for Intellectual Property calls the phenomenon ‘deprioritization.’¹⁹² She attributes this problem to HBCUs’ lack of innovation, intellectual property ownership, and technology transfer frameworks.¹⁹³ The findings of this study are evidence of deprioritization.

There is also some insight into why seeking patent licensing royalty revenue has been deprioritized. We see that evidence in some of the responses to the open-ended survey questions. For example, there were statements about heavy work loads, non-responsiveness from administration, and similar logistical hurdles. Evidence of deprioritization is found in the statements of seven respondents who indicated that they did not understand what technology transfer is. Further, some respondents indicated that their HBCU has no TTO or other technology transfer system, which also signals deprioritization. There were also statements about the lack of resources, time wasting, and a deficiency in knowledge surrounding intellectual property protection and marketing.

¹⁹² Agwu, *supra* note 156, at 4; see Hamilton, *supra* note 113, for evidence of low technology transfer activity.

¹⁹³ Agwu, *supra* note 156.

Also, one respondent mentioned that favoritism toward select faculty fosters a competitive culture. This has been an issue at majority schools¹⁹⁴ and can cause faculty to deprioritize engaging in technology transfer.

Further, the literature review revealed that Morgan State University, North Carolina A&T University, and Howard University are well on their way to R-1 status.¹⁹⁵ This was mentioned by one respondent who shared that as their university moved toward gaining R-1 status, they would need to change as a university and provide technology transfer services. They need to follow ethical guidelines and have a strong infrastructure for research administration. These HBCUs will probably be given greater R&D opportunities and future funding increases once government and corporate sector R&D sponsors get this signal. This makes it easier for universities to draw in top-notch teachers, graduate students, and undergraduates. Additionally, the R-1 universities provide a substantial contribution to meaningful research that addresses real world problems related to societal well-being.¹⁹⁶

Some respondents did mention having issues with the lack of information sharing about technology transfer processes at their HBCU. Research, development, and the creation of new inventions are largely carried out by research faculty and their graduate students. The finding herein that there is a lack of information sharing is in alignment with recent research at the University of District of Columbia, which is a HBCU. While a PhD student at the University of District of Columbia, Dr. Sampson Addo and his team surveyed 15 engineering graduate students and discovered that 93% were not aware of internal or external commercialization programs.¹⁹⁷ In a different study, it was discovered that 88% Hispanic women and 86% Black women have minimal or no knowledge of patenting.¹⁹⁸ The issue of a lack of awareness among women is in alignment with the fact that 65% of the survey respondents for this article's research were men.

¹⁹⁴ See generally Clovia Hamilton & David Schumann, *Love and Hate in University Technology Transfer: Examining Faculty and Staff Conflicts and Ethical Issues*, THE CONTRIBUTION OF LOVE AND HATE TO ORGANIZATIONAL ETHICS (Michael Schwartz & Howard Harris eds., 2016); see also Clovia Hamilton & David Schumann, *Love and Hate in University Technology Commercialization Proposed revision to the Bayh Dole Act*, 42 HOFSTRA EMPLOYMENT L. (2025).

¹⁹⁵ Weissman, *supra* note 62.

¹⁹⁶ FORWARD PATHWAY, *The Importance of R1 Classification in Higher Education and Economic Development*, <https://www.forwardpathway.us/the-importance-of-r1-classification-in-higher-education-and-economic-development> (last visited Dec. 13, 2025).

¹⁹⁷ Addo et al., *supra* note 147.

¹⁹⁸ RSCH. 2 IMPACT, *The Role of Trust in Advancing Equity in Innovation, Invent Together* 16 (Apr. 2024), <https://live-inventtogether.pantheonsite.io/wp-content/uploads/The-Role-of-Trust-in-Advancing-Equity-in-Innovation.pdf>.

Lastly, are the three propositions supported?

Proposition 1. It is proposed that emerging research institution representatives often compare the research, technology commercialization, and academic entrepreneurship performance of their emerging research institution to those of established research institutions.

The most frequent response was that emerging research institution representatives compare “somewhat” rather than often.

Proposition 2. It is proposed that emerging research institution representatives seek out the opinions of representatives at established research institutions regarding research, technology commercialization and academic entrepreneurship.

Most emerging research institutions representatives responded that they liked to know and tried to find out established research institutions representatives’ opinions fairly rarely (10-25% of the time) in regard to acquisition of government and industry sponsored research funding, technology commercialization, partnerships between academia and industry, and acquisition of new business ventures.

Proposition 3. It is proposed that emerging research institution representatives compare their institution’s procedures for research, technology commercialization, and academic entrepreneurship to the procedures of established research institutions.

The survey participants frequently (about 50-75% of the time) paid attention to how their institution does things compared to how majority schools do things to acquire government and industry sponsored research funding.

VII. RECOMMENDATIONS

Based on the findings and discussions, it is recommended that emerging research institutions like HBCUs follow AUTM’s CEO Dr. Stephen Susalka’s sound advice to hire USPTO experienced TTO staff, get patent application assistance on their campuses, and get their leaders trained.¹⁹⁹ It is also recommended that these emerging research institutions develop and implement sound intellectual property policies that include incentives such as revenue sharing and counting technology transfer in tenure and promotion decisions. Policies should also state that practices such as exercising favoritism toward certain select faculty will be met with harsh penalties. Further, information sharing is imperative. All faculty and graduate student researchers need annual

¹⁹⁹ Susalka, *supra* note 85.

training on the technology transfer policies and systems that are in place. Consistent monthly news publications and annual patent award ceremonies are also helpful.

Technology transfer requires evaluating invention disclosures for patentability and marketability.²⁰⁰ There needs to be funding in place to pay for this service and for patent protection. Patenting is very expensive. More importantly, getting competent TTO assistance is not cheap. Yet being serious about securing resources for these services is imperative to motivate researchers at emerging research institutions.

There are many partnerships mentioned in this study. But a real assessment of competence would be useful. Many consultants and academics are in this field, but how many have the unique esoteric ability to carry out TTO services efficiently and effectively with experience that builds trust? It is rare to come across an expert with business development, patent protection, patent licensing, and marketing experience. And the use of a team of experts can be costly. The good news is that are paths forming to encourage future growth in this area. K-12 and undergraduate educational programs prepare students to become graduate student researchers and faculty researchers that invent and understand technology transfer is the way forward.

Several survey respondents mentioned that their institutions had a lack of resources and competition for limited resources. So, it is recommended that dedicated funds be established at emerging research institutions by their leaders for these purposes. This should be done in addition to applying for and engaging in low-cost training opportunities, grant programs, and partnerships that are available. While reaching out to HBCU alums for athletics and marching band programs, there should be intentional outreach for donated investments in R&D and technology transfer services.

With regard to legal reform, it is highly unlikely that emerging research institutions were considered when the Bayh Dole Act was passed. That legislative history should be searched as a future research project. University reported information to the federal government gets reported to Congress.²⁰¹ Specifically,

the Technology Transfer Commercialization Act of 2000 require[s] Commerce to provide Congress with summary reports on federal agencies' patent licensing and other technology transfer activities. Since 2007, Commerce has

²⁰⁰ AUTM, *Technology Transfer and How It Impacts the World*, <https://autmfoundation.com/about/technology-transfer-impact/> (last visited Dec. 13, 2025).

²⁰¹ U.S. GOV'T ACCOUNTABILITY OFF., *Biomedical Research NIH should publicly report more information about the licensing of its intellectual property*, Report GAO-21-52, 7 (2020), <https://www.gao.gov/assets/720/710328.pdf>.

delegated to [the National Institute of Standards and Technology in the U.S. Department of Commerce (NIST)] the role of providing to Congress an annual report summarizing technology transfer activities at federal agencies.²⁰²

The Bayh Dole Act 37 CFR 401.16 federal agency reporting requirements state that “[f]ederal agencies will report annually to the Secretary on data pertaining to reported subject inventions under a funding agreement...” including data such as the number of inventions reported to the federal agency, patent applications, issued patents, and assignment of invention rights.²⁰³ The federal agencies get this information from universities that have received federal research funding.²⁰⁴ Given that HBCUs are woefully behind majority schools in university technology transfer, an amendment to the Bayh Dole Act is recommended. Specifically, the 37 CFR 401.16 federal agency reporting requirements²⁰⁵ need to change to require that majority schools and emerging research institutions report their licensing activities to the federal government. In addition, national trade organizations that: (1) receive federal funding, and (2) publish annual university patent licensing revenues should be required to include data about emerging research institutions in their annual reports. They can get this information with Freedom of Information Act (FOIA) requests, and they can encourage voluntary disclosures.²⁰⁶ FOIA applies to federal agencies.²⁰⁷ So, when federal agencies sponsor a university’s research, this information can likely be obtained from a FOIA request submitted by such a national trade organization.²⁰⁸ This will likely bring much needed awareness and monitoring of this issue.

VIII. CONCLUSION

As new technology has driven market growth globally, the U.S. has struggled to develop a workforce capable of competing in the global marketplace.²⁰⁹ The NAS advocates that to sustain the U.S.’s research and innovation capabilities, there needs to be a strategy to increase participation of

²⁰² *Id.*

²⁰³ 37 CFR § 401.16 Title 37 - Patents, Trademarks, and Copyrights, Chapter IV - National Institute of Standards and Technology, Department of Commerce, Part 401- Rights to Inventions made by nonprofit organizations and small business firms under government grants, contracts, and cooperative agreements, 401.16 Federal agency reporting requirements (2025).

²⁰⁴ *Id.*

²⁰⁵ *Id.*

²⁰⁶ U.S. DEP’T OF JUST., *What Is FOIA?*, <https://www.foia.gov/faq.html> (last visited Dec. 13, 2025).

²⁰⁷ *Id.*

²⁰⁸ *Id.*

²⁰⁹ NAS (2011), *supra* note 140.

underrepresented minorities in science and engineering.²¹⁰ Preparing a diverse pipeline of students is a solution to this growing problem. This preparation can be a win-win. Emerging research institutions such as HBCUs need alternative financial revenue streams. What sits at the crossroads of these two issues is university technology transfer. University technology transfer can be used to both prepare students to meet the global demands caused by new technology and the licensing revenues can be used to provide a revenue stream for HBCUs.

Administrators at emerging research institutions such as HBCUs have complained of being severely under-resourced and of a decline in financial support from government sources.²¹¹ The U.S. Air Force and NAS have investigated this problem²¹² through studies of HBCUs' research and technology transfer performance regarding patenting, licensing revenue generation, and start-up business formation. The study mentioned that increased research²¹³ and tech commercialization activity.²¹⁴ Perhaps these activities can assist emerging research institutions in their effort to increase funding and become more financially stable.

Despite the plethora of corporate, federal and HBCU/majority school partnerships (many examples mentioned herein), this is still a serious problem that needs closer attention.

If emerging research institution representatives have a propensity toward comparing their employer to established research institutions, and if they believe their employer is not measuring up, then that social comparison may result in this group being motivated to improve their performance based on lessons gleaned from the social comparison theory. Thus, it was imperative to discover through experimentation whether emerging research institution STEM faculty and STEM administrators compare the research, technology commercialization, and academic entrepreneurship performance of their emerging research institution to the performance of established research institutions.

Likewise, it was important to learn whether the emerging research institution STEM faculty and STEM administrators seek out the opinions of representatives at established research institutions regarding research, technology commercialization and academic entrepreneurship. Further, the level and extent of comparison by emerging research institution representatives

²¹⁰ *Id.* at 2.

²¹¹ Jones, *supra* note 50.

²¹² NAS (2011), *supra* note 140; *see also* Sullivan, *supra* note 53; *see also* Tractell, Inc., *Customized Blueprints to Enhance the Participation of HBCU/MIs in DoD-Related R&D Programs*, AD-A245 212 (OFF. OF THE SEC'Y OF DEF., OFF. OF SMALL & DISADVANTAGED BUS. UTILIZATION & NAT'L ASS'N FOR EQUAL OPPORTUNITY IN HIGHER EDUC. (1991).

²¹³ Sullivan, *supra* note 53.

²¹⁴ Tractell, *supra* note 212; NAS (2011), *supra* note 140.

to established research institutions with respect to research, technology commercialization, and academic entrepreneurship needed to be uncovered. A stated-choice survey was conducted to test three (3) propositions. There are 99 HBCUs in the U.S.²¹⁵ Twenty-five (25) with STEM faculty and administrators were included in this study. There were 245 respondents. Although the most frequent responses were that technology transfer and academic entrepreneurship are not priorities, social comparison theory indicates that these HBCU STEM faculty members and STEM administration may be motivated to make improvements. The open-ended questions tested whether the respondents believe that their HBCU employers are measuring up to the majority school research institutions. The negative responses identifying problem areas at the HBCUs are evidence that respondents are aware of areas that need improvement and areas where the HBCUs are not measuring up to established research institutions. Again, when a group is not measuring up, they may be motivated to improve. These are important findings because there needs to be motivation to engage in technology transfer for it to be implemented in HBCUs.

Given that HBCUs are woefully behind majority schools in university technology transfer, and that there is evidence of motivation to improve, an amendment to the Bayh Dole Act is recommended. Specifically, the 37 CFR 401.16 federal agency reporting requirements need to change to require that emerging research institutions report their licensing activities. In addition, national trade organizations like AUTM which publish annual data on university technology transfer need to include data about emerging research institutions in their annual reports. This will likely increase transparency and bring much needed awareness and monitoring of this issue.

For future research, there are Title III universities and there are non-Title III universities. For example, some school categories defined in Title III of the Higher Education Act of 1965 include:

- Historically Black Colleges and Universities (HBCUs)
- Minority serving institutions (MSIs)
- Hispanic serving institutions (HSIs)
- Native American Serving Non-tribal institutions (NASNTIs)
- Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI).²¹⁶

²¹⁵ U.S. DEP'T OF EDUC., *What is an HBCU?*, <https://sites.ed.gov/whhbcu/one-hundred-and-five-historically-black-colleges-and-universities/#:~:text=The%20Higher%20Education%20Act%20of%201965%2C%20as%20amended%2C,agency%20or%20association%2C%20making%20reasonable%20progress%20toward%20accreditation.%E2%80%9D> (last visited Dec. 13, 2025).

²¹⁶ U.S. DEP'T OF EDUC., *Eligibility Designations for Higher Education*

Besides implementation at HBCUs, it is recommended this proposed theoretical framework and novel stated-choice survey be implemented at other Title III emerging research institutions as well.

Appendix A. Doctoral HBCU research expenses and doctoral completions

HBCU	enrollment total FTE all students Fall 2023	Core research expense per FTE FY 2023	total R&D expenses (x1,000s) 2023	federal research expenditure (x1,000s) 2023	completed doctorates research/scholarship oriented 2022-2023	completed doctorates professional practice 2022-2023	R-1 eligible?	ERI?
Alabama State	3,870	1,186	3,229	2,848	4	22	NO	YES
Clark Atlanta	4,135	2,689	10,320	7,687	36	0	NO	YES
Florida A&M	8,265	3,675	65,159	54,363	33	233	NO	NO
Hampton University	3,649	4,370	9,769	9,445	28	18	NO	YES
Howard University	13,419	6,482	84,756	47,662	102	389	YES	YES
Jackson State University	6,564	6,058	19,457	16,443	68	0	NO	YES
Meharry Medical College	1,083	24,117	22,002	18,398	6	183	NO	YES
Morehouse School of Medicine	935	53,520	57,125	41,069	5	94	NO	YES
Morgan State University	9,804	10,052	43,868	30,451	59	0	NO	YES
North Carolina A&T	13,885	3,189	62,307	37,152	68	0	NO	YES
Prairie View A&M	9,517	3,202	21,791	12,354	26	0	NO	YES
Southern University and A&M College Baton Rouge	8,249	1,346	5,201	4,444	42	232	NO	YES
Tennessee State University	8,198	2,556	28,246	15,983	44	35	NO	YES

Texas Southern University	8,469	882	16,287	10,969	28	209	NO	YES
University of Maryland Eastern Shore	2,844	7,809	10,739	10,201	16	66	NO	YES

Table 1. Doctoral HBCU research expenses and doctoral completions²¹⁷

Notes: 2023-2024 academic year for enrollment and completed doctorates; and FY 2023 for research expenses. An emerging research institution (ERI) per the U.S. Chips and Science Act’s definition has < \$50 million in federal research expenses.²¹⁸ The criteria for a U.S. institution to be designated as R-1, on average in a single year, it must spend at least \$50 million in total research spending and produce at least 70 research doctorates.²¹⁹ The R-2 designation is defined as an institution with high spending and doctorate production with at least \$5 million in total research spending and conferring at least 20 research doctorates on average in a single year.²²⁰

²¹⁷ NAT’L CTR. FOR EDUC. STAT. (NCES), *Integrated Postsecondary Education Data System (IPEDS)*, U.S. DEP’T OF EDUC., (2023-2024), <https://nces.ed.gov/ipeds/datacenter/InstitutionByName.aspx?stepId=1&sid=f4f3a026-7d69-4692-bcf0-64dba7d12dd8&rtid=6> (Note that the dataset search strategy was NCES>IPEDS look up an institution > type in the institution’s name. For core expense research expenses per FTE, hover over research in the bar chart to get the research expenses per FTE. For total R&D expenses and federal research expenditures, the NSF National Center for Science and Engineering Statistics (NCSES) Higher Education R&D (HERD) survey data was relied on. The website is [NCSESdata.nsf.gov/profiles](https://ncesdata.nsf.gov/profiles)>search by institution name>type in institution name>go to R&D expenditures>click on total by field 2023-24. Go to federally funded by agency for federal research expenditures).

²¹⁸ 42 U.S.C. §18901(5).

²¹⁹ CARNEGIE, *supra* note 59.

²²⁰ *Id.*

*Appendix B. HBCU/non-profit partners***National Academy of Sciences (NAS)**

In addition to the outstanding work that the Association for the Advancement of Science (AAAS) is doing with the HBCU Innovation Showcases and Emerging Researchers Network (ERN) conferences, there are several non-profit organizations that are hard at work striving to assist HBCUs. For example, the NAS is a non-profit organization that was established by the U.S. Congress in 1863.²²¹ It includes the National Research Council, National Academy of Engineering, and National Academy of Medicine.²²² These Academies serve to provide independent, objective analysis and advice to the nation, engage in activities that address complex challenges and inform public policy, and promote education, research, public understanding, and recognition of excellence in science, engineering, and medicine.²²³

In 2011, the NAS published a study of underrepresented minority participation in U.S. science and technology.²²⁴ The 2011 report entitled *Expanding Underrepresented Minority Participation* calls for a larger and stronger science and engineering workforce in the U.S.²²⁵ NAS defines underrepresented minorities as “African Americans, Hispanic or Latino/[a] Americans, Native Americans and Alaska Natives, and Native Hawaiians and Pacific Islanders.”²²⁶ The NAS advocates that in order to sustain the U.S.’s research and innovation capabilities, there needs to be a strategy to increase participation of underrepresented minorities in science and engineering.²²⁷

They state that the reliance on a science and engineering workforce that is predominantly male and white has fluctuated.²²⁸ There have been some gains in women joining the workforce in science and engineering and increasing reliance on international students.²²⁹ There is reliance on Asian and non-U.S. citizen workers primarily from China and India.²³⁰ The report states that there is “uncertainty about the future participation of international students” and suggests that the U.S. needs to draw on the fastest growing domestic school-age population which are the underrepresented minorities in science and

²²¹ NAS, *National Academies of Science - Organization*, National Academies of Science (2025), <https://www.nasonline.org/about-the-nas/organization/>.

²²² *Id.*

²²³ *Id.*

²²⁴ NAS (2011), *supra* note 140.

²²⁵ *Id.* at 1–2.

²²⁶ *Id.* at 22.

²²⁷ *Id.* at 2.

²²⁸ *Id.*

²²⁹ *Id.*

²³⁰ *Id.*

engineering.²³¹ Lastly, the report views diversity as an asset since it will enhance the U.S.’s global economic leadership, innovation and science and engineering talent sources.²³²

NAS made six recommendations for action. They are: (1) broaden participation and success of underrepresented minorities in STEM with pathways at the elementary and high school levels upstream in order to change the outcomes of doctoral classes downstream; (2) “galvanize stakeholders and resources” to forge a sustained, deliberate national effort to address underrepresented minority participation; (3) prioritize underrepresented minority participation and success in STEM by forging a comprehensive national approach that includes all stakeholders, programs and segments of a student’s pathway from preschool through graduate school; (4) offer “adequate preparation, financial support, mentoring, social integration, and professional development” at all levels to “[s]tudents who have not had the same degree of exposure to STEM and to postsecondary education”; (5) use a coordinated approach to leverage resources and support of existing federal STEM programs with demonstrated success in the preparing and advancing underrepresented minorities in STEM; and (6) evaluate undergraduate STEM programs and partnerships to increase underrepresented minorities’ inclusion and success in STEM.²³³

In 2019, NAS published another study that acknowledged how minority serving institutions (MSIs) are resources that are not fully utilized.²³⁴ To re-establish the U.S.’s preeminence in STEM innovation and productivity, NAS claims that the number of well-educated STEM workers can be increased by tapping into MSIs as a resource.²³⁵

It recommends: (1) increasing federal funding, (2) enhancing partnerships between MSIs and industry, (3) improving data collection on MSI outcomes,

²³¹ *Id.* at 3.

²³² *Id.* at 3, 24, 27; see also SCOTT PAGE, *THE DIFFERENCE: HOW THE POWER OF DIVERSITY CREATES BETTER GROUPS, FIRMS, SCHOOLS, AND SOCIETIES* (Princeton University Press, 2007). The National Academies of Science cites Scott Page who argues that when innovation is a goal, diverse groups are stronger than homogeneous groups and are smarter. This could enhance the U.S.’s ability to compete globally. In addition, see Thomas Kochan, et al., *The effects of diversity on business performance: Report of the Diversity Research Network*, 42 J. HUM. RES. MGMT. (2003), where Kochan et al. advocate that when companies use diversity as a resource for innovation and learning, there is an overall positive effect. There is also best business performance when there is diversity across all organizational units.

²³³ NAS (2011), *supra* note 140, at 143–48.

²³⁴ See generally NAS, *MINORITY SERVING INSTITUTIONS: AMERICA’S UNDERUTILIZED RESOURCE FOR STRENGTHENING THE STEM WORKFORCE 1* (2019).

²³⁵ *Id.* at 2.

and (4) boost MSIs' capacity to educate and train more STEM graduates by providing targeted faculty development support and infrastructure improvements.²³⁶

Michelson Foundation

Dr. Gary Michelson founded the Michelson 20MM Foundation.²³⁷ Dr. Michelson became world-renowned as a surgical innovator and the most prolific inventor in medical history, holding over 990 patents worldwide, and his groundbreaking advancements in spinal surgery—where outcomes are often unpredictable and recovery can be long and painful—consistently led to improved patient results through innovative procedures, instruments, and implants.²³⁸ Dr. Michelson became a philanthropist after the sale of his patents to Medtronic, the biggest medical device company in the world, which made him a billionaire in 2005.²³⁹

The Michelson 20MM Foundation focuses on improving access to higher education and supporting an educational technology initiative to increase educational equity.²⁴⁰ There is a Michelson Institute for Intellectual Property (MIIP), HBCU IP Futures Collaborative and related Michelson IP HBCU Program.²⁴¹ In one example, De'Marco Poole, a student at the HBCU South Carolina State University, used what he learned in the Michelson IP Futures Collaborative to apply for a patent related to food preparation.²⁴² The Michelson IP HBCU program aims to empower students at HBCUs with the knowledge and tools needed to protect, share, and commercialize their innovations through

²³⁶ *Id.* at 143–48.

²³⁷ Gary Michelson, *Dr. Gary K. Michelson Biography* (2024), <https://www.garykmichelson.org/biography> (last visited Dec. 13, 2025).

²³⁸ *Id.*

²³⁹ *Id.*

²⁴⁰ MICHELSON PHILANTHROPIES, *The Power of 20 Million Minds: A Leader in the Fight for Textbook Affordability, Digital Equity, and Smart Justice*, <https://www.michelsonphilanthropies.org/news/the-power-of-20-million-minds-2023-impact/> (last visited Dec. 13, 2025).

²⁴¹ MICHELSON IP INST., *The HBCU IP future collaborative—About the Program*, (2024), <https://michelsonip.com/hbcu-ip-futures-collaborative/> (last visited Dec. 13, 2025).

²⁴² Justin Chapman, *Putting the 'Fast' Back in Fast Food*, MICHELSON PHILANTHROPIES (Oct. 31, 2022), <https://www.michelsonphilanthropies.org/news/putting-the-fast-back-in-fast-food/>; *see also* Justin Chapman, *Lighting a Fire: Faculty at Historically Black Colleges and Universities are Exposing Eager Students to IP Fundamentals*, MICHELSON PHILANTHROPIES (2022), <https://www.michelsonphilanthropies.org/news/hbcus-exposing-eager-students-to-ip-fundamentals/>.

intellectual property (IP) education.²⁴³ Among the STEM, entrepreneurship, engineering, maker, creative, and business HBCU communities, they seek to raise awareness and advocate for IP protection.²⁴⁴

The Michelson IP HBCU Program provides educational content focused on IP rights, helping students understand how to leverage IP to capture the value of their ideas.²⁴⁵ They share the best practices and insights for IP instruction with participating HBCU faculty members.²⁴⁶ Each participating HBCU receives a \$25,000 grant and access to MIIP's digital resources to support the development of IP-focused curricula and programming.²⁴⁷ For example, engineering assistant professor Kevin Santiago at the HBCU Norfolk State University used his \$25,000 grant to create curriculum to teach students how to protect their IP.²⁴⁸ He is working with two other HBCUs, Hampton University and Clark Atlanta University, to add IP modules into undergraduate courses.²⁴⁹ The goal is to encourage student entrepreneurship and innovation.²⁵⁰ It is also important to note that the Michelson Institute of Intellectual Property has reached at least 750 students.²⁵¹

Innovate Alabama

Innovate Alabama is a public-private partnership focused on entrepreneurship, technology and innovation with a mission to help innovators grow roots in Alabama.²⁵² The organization provides workforce development and resources to entrepreneurs.²⁵³ They claim to help build a supportive ecosystem where innovators can thrive in their careers and personal lives.²⁵⁴ In 2023, Innovate Alabama launched the Innovate Alabama HBCU Innovation Experience for networking and engagement.²⁵⁵

²⁴³ Justin Chapman, *Lighting a Fire: Faculty at Historically Black Colleges and Universities are Exposing Eager Students to IP Fundamentals*, MICHELSON PHILANTHROPIES (2022), <https://www.michelsonphilanthropies.org/news/hbcus-exposing-eager-students-to-ip-fundamentals/>.

²⁴⁴ MICHELSON IP INST., *supra* note 241.

²⁴⁵ Justin Chapman, *Lighting a Fire: Faculty at Historically Black Colleges and Universities are Exposing Eager Students to IP Fundamentals*, MICHELSON PHILANTHROPIES (2022), <https://www.michelsonphilanthropies.org/news/hbcus-exposing-eager-students-to-ip-fundamentals/>.

²⁴⁶ *Id.*

²⁴⁷ *Id.*

²⁴⁸ NORFOLK STATE UNIV., *Intellectual Property Education in HBCUs*, (Mar. 9, 2022).

²⁴⁹ *Id.*

²⁵⁰ *Id.*

²⁵¹ Agwu, *supra* note 156, at 7.

²⁵² INNOVATE ALA., *Innovate Alabama- About* (2025), <https://innovatealabama.org/about/#overview>.

²⁵³ *Id.*

²⁵⁴ *Id.*

²⁵⁵ INNOVATE ALA., *Innovate Alabama launches HBCU innovation experience in*

Innovate Alabama's goal is to support HBCU academic leaders in connecting with peers to explore opportunities in internships, employment, and investment tied to digital technology skills and entrepreneurial product innovation.²⁵⁶ Through a multi-phased approach to tech and innovation training and practical learning opportunities, Innovate Alabama also hopes to target HBCU students.²⁵⁷ They are focusing on engagement with minorities and HBCUs to foster a more diverse and inclusive environment in technology and entrepreneurship throughout the State of Alabama.²⁵⁸

Kentucky Commercialization Ventures

The Kentucky Commercialization Ventures (KCV) serves as the State of Kentucky's commercialization program.²⁵⁹ It provides tools and expertise on how to transfer innovative IP into commercial marketplaces.²⁶⁰ KCV partners with several universities located in Kentucky including the MSI Kentucky State University.²⁶¹

University-Industry Demonstration Partnership (UIDP)

The UIDP HBCU initiative serves to create guidance that equips company representatives and R1 universities with essential context and proven practices to build effective, mutually beneficial engagement strategies with HBCUs.²⁶² The program includes a webinar showcase of HBCU research strengths and capacities.²⁶³ Since 2022, there have also been annual HBCU Engage conferences.²⁶⁴ In 2023, an *HBCU Engage Pitchfest* was added to the annual conference to encourage students at HBCUs to compete for a \$10,000 award for pitching and exploring a STEM related research question.²⁶⁵

Lumina Foundation

The Lumina Foundation is a private non-profit that strives to make learning beyond high school available, easy to navigate, and fair.²⁶⁶ The Lumina

collaboration with The Alabama Collective, (Mar. 15, 2023).

²⁵⁶ INNOVATE ALA., *HBCU Innovation Experience*, (2025), <https://innovatealabama.org/programs/hbcu-innovation-experience/>.

²⁵⁷ *Id.*

²⁵⁸ *Id.*

²⁵⁹ KY. INNOVATION, *Kentucky Commercialization Ventures*, (2025), <https://www.kyinnovation.com/kcv/>.

²⁶⁰ *Id.*

²⁶¹ *Id.*

²⁶² UNIVERSITY-INDUSTRY DEMONSTRATION P'SHIP (UIDP), *UIDP HBCU Initiative*, (n.d.), <https://uidp.org/about-us/uidp-hbcu-initiative/>.

²⁶³ *Id.*

²⁶⁴ *Id.*

²⁶⁵ *Id.*

²⁶⁶ LUMINA FOUND., *About Lumina Foundation*, (n.d.), <https://www.luminafoundation>

Foundation’s goal by 2040 is that 75% of working-age people in the U.S. will have college degrees or other credentials of value through changing how individuals get trained and educated after high school.²⁶⁷ In 2018, the HBCU Morgan State University’s President joined the Lumina Foundation board.²⁶⁸ The foundation has been working closely with HBCUs on equity in education ever since.²⁶⁹

In 2022, the foundation published a report entitled “The HBCU Effect” which emphasizes that HBCUs’ peer networks have influential workforce outcomes for students.²⁷⁰ For example, higher income levels were associated with greater satisfaction among HBCU alumni with their alma maters’ networks.²⁷¹ The authors advocate that practitioners at Predominantly White Institutions (Majority Schools) “should draw upon the existing research and narratives about the ways that HBCUs properly support Black students and replicate those support practices and networks on their campuses as much as possible.”²⁷² They also recommend that HBCUs “draw upon the early experiences that alumni describe to develop early intervention programming for first-year students...”²⁷³ This will empower these students with the insights and relationships essential for navigating campus life and building early college connections.²⁷⁴ In addition to the HBCU Effect report, in 2024, Lumina held the *Lumina Foundation’s HBCU24 Conference* in New Orleans.²⁷⁵

VentureWell/ Black Tech Ventures partnership

Unlike the success of the Michelson IP HBCU program, some partnerships have not gained traction. Some struggle. Some have come and gone. Some morph. For example, in 2014, the Association of Public and Land Grant Universities (APLU), VentureWell, the USPTO, and United Negro College

.org/about/.

²⁶⁷ *Id.*

²⁶⁸ LUMINA FOUND., *Lumina Foundation announces election of new board member*, Lumina Foundation (Jan., 4, 2018), <https://www.luminafoundation.org/news-and-views/lumina-foundation-announces-election-of-board-member-david-wilson/>.

²⁶⁹ *Id.*

²⁷⁰ Megan Covington, et al., *The HBCU Effect: An Exploration of HBCU Alumni's Peer Networks and Workforce Outcomes*, Issue Lab, UNCF (2022), <https://search.issuelab.org/resource/the-hbcu-effect-an-exploration-of-hbcu-alumni-s-peer-networks-and-workforce-outcomes.html>.

²⁷¹ *Id.*

²⁷² *Id.*

²⁷³ *Id.*

²⁷⁴ *Id.*

²⁷⁵ LUMINA FOUND., *HBCU24 Conference Collectively Advancing the Power of HBCUs*, (2024), <https://myemail.constantcontact.com/Don-t-miss-HBCU24--The-deadline-to-book-your-room-is-THIS-FRIDAY-.html?soid=1141356256111&aid=waBas2j7Ys8>.

Fund (UNCF) came together to sponsor a HBCU Collaborative initiative.²⁷⁶ It was to be a collaboration of 15 HBCUs “to encourage the creation of more government and industry partnerships to foster innovation, commercialization, and entrepreneurship.”²⁷⁷ In 2025, VentureWell announced that it is now in a partnership with Black Tech Ventures to foster entrepreneurship in HBCUs.²⁷⁸ Black Tech Ventures includes two Howard University professors and a UNCF representative.²⁷⁹

Emerging Research Institution Coalition (ERIC)

Like the APLU’s HBCU Collaborative, the ERIC was launched to encourage the creation of more government and industry partnerships to foster innovation, commercialization, and entrepreneurship.²⁸⁰ Dr. Anna Quider, an astrophysicist, and Dr. Jess Venable founded ERIC.²⁸¹ They provide listings of grants and contracts resources and related consulting services.²⁸²

Council on Government Relations (COGR)

COGR historically has served R-1 and R-2 institutions.²⁸³ For example, in 2024, COGR launched an emerging research institution pilot program.²⁸⁴ They charge a \$3,500 participation fee per institution for access to their resources and events.²⁸⁵ They define emerging research institution differently than the CHIPS and Science Act. The CHIPS and Science Act’s definition is less than \$50 million dollars in federal funding.²⁸⁶ COGR’s pilot program states that emerging institutions are to have less than \$15 million in federal funding.²⁸⁷

²⁷⁶ NAS, *supra* note 234, at 159–60; ASS’N OF PUB. LAND-GRANT UNIV. (APLU), *HBCU Innovation and Entrepreneurship Collaborative* (2014), <https://www.aplu.org/our-work/5-archived-projects/access-and-diversity/hbcu-innovation-commercialization-and-entrepreneurship/>.

²⁷⁷ NAS, *supra* note 234, at 159–60; *see also* APLU *supra* note 276, where APLU reported that the collaborative was funded by the Lumina Foundation and Lemelson Foundation.

²⁷⁸ VENTUREWELL, *Black Tech Ventures and VentureWell launch partnership*, (2025), <https://venturewell.org/black-tech-ventures/>.

²⁷⁹ *Id.*

²⁸⁰ EMERGING RSCH. INSTITUTIONS COALITION (ERIC), *About Emerging Research Institutions Coalition*, (2025), <https://eri-coalition.org/about-eric>.

²⁸¹ *Id.*

²⁸² *Id.*

²⁸³ Council on Gov’t Relations (COGR), *COGR’s Emerging Research Institutions Pilot Program - Accepting Applications*, (2025), available at <https://www.cogr.edu/cogrs-emerging-research-institutions-pilot-program>.

²⁸⁴ *Id.*

²⁸⁵ *Id.*

²⁸⁶ 42 U.S.C. §18901(5).

²⁸⁷ COGR, *supra* note 283.

American Heart Association and Mercy Deliverance Ministries

The American Heart Association launched the HBCU Scholars Program.²⁸⁸ They note that from “2020-2021, only 8% of med students and 6.9% of med school graduates in the U.S. were African American.”²⁸⁹ African Americans aged 18-49 are twice as likely to die from heart disease than Caucasians and African Americans between the age of 35 and 64 are 50% more likely to have hypertension.²⁹⁰ The American Heart Association takes the stance that people of color contribute diverse perspectives to scientific research and those that enter healthcare professions are more likely to serve their communities.²⁹¹ Thus, their program serves to help HBCU scholars learn about the health of individuals in the students’ communities, conduct research projects and explore careers.²⁹² The American Heart Association also wants to “increase the number of Black students who can compete successfully for acceptance and matriculation into graduate programs leading to professional degrees in the biomedical and health sciences.”²⁹³ The business model for the program is the use of volunteer mentors.²⁹⁴

Student Freedom Initiative

The Student Freedom Initiative is a charity that serves “as a catalyst for freedom in professional and life choices for students attending Minority Serving Institutions.”²⁹⁵ African American philanthropist Robert F. Smith, Chair and CEO of Vista Equity Partners, donated \$50 million to this charity for eleven HBCU junior and senior undergraduate STEM majors.²⁹⁶ This initiative’s objective is to alleviate these students’ loan debt.²⁹⁷

Center for Minority Serving Institutes at Rutgers University

There are Title III universities and there are non-Title III universities. For example, some school categories defined in Title III of the Higher Education

²⁸⁸ AM. HEART ASSOC., *HBCU Scholars Program*, <https://web.archive.org/web/20250306112404/https://www.heart.org/en/about-us/office-of-health-equity/hbcu-scholars-program>.

²⁸⁹ *Id.*

²⁹⁰ CENTERS FOR DISEASE CONTROL AND PREVENTION (CDC) Archive, *Vital Signs African American Health*, <https://archive.cdc.gov/#/details?q=vital%20signs%20african%20american%20health%20&start=0&rows=10&url=https://www.cdc.gov/vitalsigns/aahealth/index.html>.

²⁹¹ See AM. HEART ASSOC., *supra* note 288.

²⁹² *Id.*

²⁹³ COMMUNITY-CAMPUS PARTNERSHIPS FOR HEALTH, *MSI Resources*, (n.d.) <https://ccphealth.org/partnering/msi/resources/>.

²⁹⁴ AM. HEART ASSOC., *supra* note 288.

²⁹⁵ Will Moss, *Black Billionaire Robert F. Smith to Donate \$50 Million to Support STEM Students at HBCUs*, HBCU CONNECT, (Oct. 22, 2020).

²⁹⁶ *Id.*

²⁹⁷ *Id.*

Act of 1965 include:

- Historically Black Colleges and Universities (HBCUs)
- Minority serving institutions (MSIs)
- Hispanic serving institutions (HSIs)
- Native American Serving Non-tribal institutions (NASNTIs)
- Asian American and Native American Pacific Islander-Serving Institutions (AANAPISI).²⁹⁸

Rutgers University's Center for Minority Serving Institutes (CMSI) is housed in their Graduate School of Education (GSE).²⁹⁹ This center serves to elevate the contributions of MSIs, increase scholarly research on them; connect MSI leaders to U.S. reform initiatives; provide information on higher education administration, instruction and philanthropy at MSIs; and to close achievement gaps and assessment performance in disadvantaged communities.³⁰⁰ While there is no mention of technology commercialization assistance, in September 2024, the CMSI launched a Research and Innovation Fellowship program for MSI students.³⁰¹ Supported by VentureWell, this virtual program is designed to involve students in creative problem-solving approaches addressing critical community challenges, including, but not limited to, public health, technological access, climate change, educational equity, voting rights, and income disparity.³⁰²

Appendix C. HBCU/Majority School partnerships

Auburn University

Toni Vines, Founder of Mercy Deliverance Ministries located in Vestavia Hills, Alabama,³⁰³ was asked to serve on the American Heart Association's board in 2021.³⁰⁴ Toni and her husband decided to expand the association's

²⁹⁸ U.S. DEP'T OF EDUC., *supra* note 216.

²⁹⁹ RUTGERS-NEW BRUNSWICK GRADUATE SCH. OF EDUC., *History: What is the Rutgers Center for Minority Serving Institutions*, (2025), available at <https://cmsi.gse.rutgers.edu/history>.

³⁰⁰ RUTGERS-NEW BRUNSWICK GRADUATE SCH. OF EDUC., *Mission & Purpose*, (2025), available at <https://cmsi.gse.rutgers.edu/content/mission-purpose>.

³⁰¹ Marybeth Gasman, *New CMSI Virtual Program: Research and Innovation Fellowship*, RUTGERS UNIV. CTR. FOR MINORITY SERVING INST. (CMSI) (Sept. 24, 2024).

³⁰² *Id.*

³⁰³ MERCY DELIVERANCE MINISTERIES, *Our Story*, (2025), <https://www.mercydm.org/about/>.

³⁰⁴ MERCY DELIVERANCE MINISTERIES, *Historically Black Colleges and Universities (HBCUs) Scholars Program: MDM Partners with American Heart Association to Expand HBCUs Scholars Program*, (2021), <https://www.mercydm.org/hbcus-scholars-program/>.

HBCU Scholars Program by forming a collaboration between Auburn University and Tuskegee University students.³⁰⁵ This partnership makes use of volunteer researchers at Auburn University,³⁰⁶ rather than the volunteer mentorship program originally established by the American Heart Association.

Princeton University

In 2023, Princeton University formed the *Princeton Alliance for Collaborative Research and Innovation* (PACRI) in partnership with four HBCUs and the UNCF.³⁰⁷ The goal is to work jointly on ten STEM and social science research projects.³⁰⁸ The subjects of the research include a broad range from cybersecurity to climate change and U.S. election issues.³⁰⁹

University of Maryland

In May 2023, the NSF awarded the University of Maryland \$20 million through the year 2028 to fund the Institute for *Trustworthy AI in Law and Society* (TRAILS).³¹⁰ This institute is a partnership with George Washington University, Cornell University and the HBCU Morgan State University.³¹¹ They will encourage community participation in the study of how AI can become more trustworthy through transparency.³¹² This involves an examination of social values, socio-technical perceptions, and design algorithms that promote transparency.³¹³

Purdue University

Purdue University is partnering with HBCU Morgan State University on a 3+2 aeronautics degree from Purdue.³¹⁴ Morgan State University students in the program spend their first three years at Morgan State and then complete their aeronautical and astronautical engineering degree at Purdue University.³¹⁵ Morgan State received a \$1.6 million funding grant from the nonprofit Base 11

³⁰⁵ *Id.*

³⁰⁶ *Id.*

³⁰⁷ Daniel Day, *Princeton-HBCU research collaborations continue with 10 new projects*, PRINCETON UNIV. OFF. OF THE DEAN FOR RSCH., STRATEGIC P'SHIPS & ENGAGEMENT, OFF. OF INNOVATION (Oct. 26, 2023), <https://partnerships.princeton.edu/news/2023/princeton-hbcu-research-collaborations-continue-10-new-projects>.

³⁰⁸ *Id.*

³⁰⁹ *Id.*

³¹⁰ NSF, *Award Abstract #2229885 Institute for Trustworthy AI in Law and Society (TRAILS)* (2024), https://www.nsf.gov/awardsearch/showAward?AWD_ID=2229885.

³¹¹ *Id.*

³¹² *Id.*

³¹³ *Id.*

³¹⁴ Denrie Perez, *Purdue and Morgan State University Launch Program to Expand Minority Students' Access to STEM Degrees*, ENGINEERING.COM, (Jan. 28, 2021).

³¹⁵ *Id.*

to establish a science and engineering program for designing, building, and launching rockets.³¹⁶ While that program is being developed, Purdue University is serving to provide opportunities for Morgan State University's students to earn their degrees in this area.³¹⁷

University of Kentucky

In July 2020, the University of Kentucky partnered with a national start-up incubator called XLerateHealth and the HBCU Jackson State University to launch a program aimed at accelerating healthcare innovations developed at HBCUs.³¹⁸ This partnership is called *Engaging Researchers and Innovators for Commercialization at HBCUs* (EnRICH) and is designed to train HBCU faculty and students in technology commercialization.³¹⁹

Columbia University

Since 2006, Columbia University has had a Tech Ventures program to provide "Columbia graduate students and post-docs hands-on experience working on early stage technology assessments, writing marketing abstracts, and preparing marketing campaigns."³²⁰ Within Tech Ventures, there is a program called *Diversity and Inclusion in Commercialization and Entrepreneurship* (DICE).³²¹ Their goal was to empower early-career Columbia University graduate students and post-doctoral researchers from historically underrepresented backgrounds in science entrepreneurship and commercialization.³²² They provide technology transfer education on commercialization.³²³ In addition, Columbia University's School of Professional Studies (SPS) has an HBCU fellowship program of mentorship, professional development and networking to help fellows be more competitive career candidates.³²⁴ While this program is not specific to STEM and

³¹⁶ *Id.*

³¹⁷ *Id.*

³¹⁸ Alicia Gregory, *NIH-funded network led by XLerateHealth and UK supports HBCU commercialization*, UNIV. OF KY. NEWS, (Jul. 22, 2020).

³¹⁹ *Id.*; see also Jaynay Johnson, *Accelerator XlerateHealth Partners with Jackson State University and University of Kentucky to bolster healthcare innovation at HBCUs*, FORBES, (Jan. 11, 2021, 2:23 PM).

³²⁰ COLUM. UNIV., *CTV Fellows Program*, COLUM. UNIV. TECH VENTURES (2025), <https://techventures.columbia.edu/about-ctv/ctv-fellows-program>.

³²¹ COLUM. UNIV., *Dice One Pager*, COLUM. UNIV. TECH VENTURES (2025), <https://techventures.columbia.edu/sites/techventures.columbia.edu/files/content/diceprogramstudents.pdf>.

³²² *Id.*

³²³ *Id.*

³²⁴ Melanie Eversley, *Columbia HBCU fellowship empowers students to thrive*, THE EDU LEDGER (May 20, 2019), <https://www.theeduledger.com/demographics/african-american/article/15104755/columbia-hbcu-fellowship-empowers-students-to-thrive>; see also

technology commercialization, eligible degree programs include analytics, bioethics, information strategy and narrative medicine.³²⁵

The Columbia HBCU Fellows program has had success in tech commercialization. For example, Corban Weatherspoon, a 2021 HBCU Fellow at Columbia University, earned his master's degree in technology management from Columbia's School of Professional Studies to advance his career in bringing cutting-edge technologies to market.³²⁶ He interned with Black Venture Capital Consortium as a student investment analyst.³²⁷ Corban is a coder who graduated from Delaware State University, an HBCU, with a bachelor's degree in engineering/physics with a bioengineering specialization and a mathematics minor.³²⁸

University of Illinois Chicago

In July 2021, the University of Illinois' Chicago campus announced receiving \$2.25 million in funding from the U.S. Army to partner with HBCU/MSIs to create the *EXtreme EnErgy Density* (EXEED) research center.³²⁹ Work at this center focuses on developing advanced materials with high energy density by exposing molecules to extreme environments, including intense pressure.³³⁰ The goal is to train the next generation of energetic materials scientists.³³¹

NSF Material Research Science and Engineering Centers

In July 2023, NSF announced \$162 million in support for materials research science centers (MRSECs) that provide resources to train hundreds of undergraduate and graduate students in the areas of microelectronic semiconductors, AI technologies, life sciences, next-generation manufacturing, quantum systems, sensors, and renewable energy production, and storage.³³²

COLUM. UNIV., *Columbia University HBCU Fellowship Program*, COLUM. UNIV. SCH. OF PRO. STUD. (2025), <https://sps.columbia.edu/impact/columbia-hbcu-fellowship-program>; see also, Sofia Montiel, *Columbia HBCU Fellowship Program Celebrates Five Years at Historic Low Library*, HBCU CONNECT, (Nov. 29, 2022).

³²⁵ COLUM. UNIV., *Columbia University HBCU Fellowship Program*, COLUM. UNIV. SCH. OF PRO. STUD. (2025), <https://sps.columbia.edu/impact/columbia-hbcu-fellowship-program>.

³²⁶ COLUM. UNIV., *Corban Weatherspoon Columbia HBCU Fellow 2021 | M.S. in Technology Management - Delaware State University*, COLUM. UNIV. SCH. OF PRO. STUD. (2025), <https://sps.columbia.edu/person/corban-weatherspoon>.

³²⁷ *Id.*

³²⁸ *Id.*

³²⁹ Brian Flood, *UIC awarded \$2.25M to establish Army HBCU/MI Research Center of Excellence*, UNIV. OF ILL. CHI., (Jul. 1, 2021).

³³⁰ *Id.*

³³¹ *Id.*

³³² SSTI, *NSF expands its advanced materials network with nine new centers*, SSTI,

Each center is to receive \$18 million over a six year period.³³³ The NSF Partnerships for Research and Education in Materials (PREM) program seeks to foster and expand partnerships between minority-serving institutions and DMR-supported centers or facilities, with the goal of enhancing recruitment, retention, and degree completion among individuals from groups historically underrepresented in materials research—collectively forming the PREM pathway—while simultaneously advancing high-quality research and educational efforts that reinforce these collaborations.³³⁴

These centers are described as follows:

University of Texas - Austin

The Center for Dynamics and Control of Materials will create: (1) new soft biomaterials with actively controllable structure and function that can be applied to adaptive thermal coatings and synthetic cells, and (2) atomically thin materials with unique structures that can be applied to quantum information processing, microelectronics, and other fields.³³⁵ This center is in partnership with Texas State University's Center for Intelligent Materials Assembly (CIMA) to conduct research and to provide a "pathway for underrepresented minority students into advanced degrees and careers in materials science."³³⁶

University of Washington

The Molecular Engineering Materials Center will create (1) "elastic layered quantum" materials and (2) "spin-photon nanostructures".³³⁷ This center's PREM partners for quantum materials, clean energy, and sustainability solutions research are the MSIs University of Hawai'i at Mānoa (UHM) and the University of Central Florida (UCF).³³⁸ The University of Washington's Center for Integration of Modern Optoelectronic Materials on Demand partners with

(July 13, 2023).

³³³ *Id.*

³³⁴ NSF, *Partnerships for Research and Education in Materials (PREM)*, National Science Foundation (NSF) (2023), <https://www.nsf.gov/funding/opportunities/prem-partnerships-research-education-materials>.

³³⁵ NSF, *Award Abstract # 2308817 Center for Dynamics and Control of Materials University of Texas Austin* (2023), https://www.nsf.gov/awardsearch/showAward?AWD_ID=2308817.

³³⁶ UNIV. OF TEX., *Center for Dynamics and Control of Materials: an NSF MRSEC*, University of Texas at Austin (2025), <https://mrsec.utexas.edu/cima-prem-partnership>.

³³⁷ UNIV. OF WASH., *UW Molecular Engineering Materials Center (UW MEM-C) sciences*, Research (2024), <https://mem-c.washington.edu/research/>.

³³⁸ Diana Knight, *NSF awards UW partners \$13.6M to broaden access in the sciences*, University of Washington (Nov. 13, 2024, 1:55 PM), <https://chem.washington.edu/news/2024/11/13/nsf-awards-uw-partners-136m-broaden-access-sciences>.

non-tribal American Indian serving Fort Lewis College and the HBCU Norfolk State University for quantum optoelectronic resources.³³⁹

Northwestern University

The Materials Research Science and Engineering Center seeks to develop (1) bio-inspired materials that can be programmed to carry out self-directed tasks, which could potentially include shape-morphing and self-healing, and (2) materials that transmit both ions and electrons, simulating the functions of brain neurons.³⁴⁰ In collaboration with the University of Texas in Arlington, this center partners with Grambling State University through the NSF PREM program.³⁴¹

University of Pennsylvania

The Laboratory for Research on the Structure of Matter (LRSM) has a PREM partnership with the University of Puerto Rico on research topics like the investigation of new carbon-based materials with intriguing electrical characteristics and the alteration of familiar materials' surfaces for use as purification and sensor devices.³⁴² Although the University of Puerto Rico is not a HBCU, this is a great example of a majority school partnering with a MSI. At the LRSM, Research Experiences for Undergraduates (REU) “can range from synthesizing new polymers to probing the optical properties of quantum dots, to measuring mechanical responses of soft materials such as colloids and emulsions, to computing electronic band structures of topological insulators and yet-to-be-synthesized composite materials.”³⁴³

University of California - Santa Barbara

The Materials Research Laboratory's efforts center on advancing research related to (1) innovative chemical formulations and processing techniques for solvent-free production of sustainable polymers with enhanced recyclability and (2) responsive biomaterials that emulate living systems, aimed at applications in soft implants and haptic technologies that rely on touch and

³³⁹ *Id.*

³⁴⁰ NORTHWESTERN UNIV., *Materials Research Science and Engineering Center*, (2025), <https://mrsec.northwestern.edu/>.

³⁴¹ NORTHWESTERN UNIV., *Partnerships: Materials Research Science and Engineering Center – NorthwesternUniversity*, <https://mrsec.northwestern.edu/partnerships/>.

³⁴² UNIV. OF PA. LRSM, *LRSM Awarded New PREM Grant*, (July 13, 2021), <https://www.lrsm.upenn.edu/news-item/lrsm-awarded-new-prem-grant/>.

³⁴³ NSF, *Award Abstract # 2050863 REU Site: Laboratory for Research on the Structure of Matter* (2021), https://www.nsf.gov/awardsearch/showAward?AWD_ID=2050863.

motion for interaction.³⁴⁴ This center’s PREM partners are Jackson State University and the University of Texas at El Paso.³⁴⁵

University of Wisconsin - Madison

The Wisconsin Materials Research Science and Engineering Center is advancing two key areas: (1) innovative glassy materials, including flexible metallic and thin organic semiconducting glasses, with a wide range of potential uses and (2) ultra-thin crystalline membrane materials with rapid magnetic switching capabilities, poised to drive progress in information processing, high-speed data storage, and quantum computing.³⁴⁶ Similar to the University of Pennsylvania, this center’s PREM partner is not a HBCU but rather the MSI University of Puerto Rico-Mayagüez (UPRM).³⁴⁷

University of Tennessee, Knoxville

The Center for Advanced Materials & Manufacturing is committed to (1) advancing the comprehension, design, and manipulation of quantum materials and systems using artificial intelligence, with promising applications in energy harvesting, low-power electronics, quantum computing, and innovative sensing technologies, and (2) creating materials capable of enduring the intense temperatures and pressures required for nuclear fusion and hypersonic defense technologies.³⁴⁸ This center offers a \$50,000 INCLUDE grant which require a partnership between one University of Tennessee principal investigator and “up to two Co-PIs from a Historically Black College and University (HBCU) or Minority Serving Institute (MSI), with the goal of engaging faculty, postdoctoral trainees, or students from underrepresented groups in CAMM by forming multidisciplinary teams.”³⁴⁹

³⁴⁴ Andrew Masuda, *The Materials Research Laboratory receives a six-year, \$18 million grant from NSF*, UNIV. OF CAL. SANTA BARBARA NEWS, (Sept. 15, 2023).

³⁴⁵ UNIV. OF CAL. SANTA BARBARA MRL, *PREM - Partnership for Research and Education in Materials*, UNIV. OF CAL. SANTA BARBARA (2024), <https://mrlweb.mrl.ucsb.edu/education/undergrad/prem>.

³⁴⁶ NSF, *Award Abstract # 1720415 Wisconsin Materials Research Science and Engineering Center* (2022), https://www.nsf.gov/awardsearch/showAward?AWD_ID=1720415

³⁴⁷ UNIV. OF WISCONSIN-MADISON, *Partnerships for Research and Education in Materials*, (2024), <https://mrsec.wisc.edu/prem/>.

³⁴⁸ UNIV. OF TENN. KNOXVILLE, *Center for Advanced Materials and Manufacturing*, (n.d.), available at <https://camm.utk.edu/>.

³⁴⁹ UNIV. OF TENN. KNOXVILLE, *Center for Advanced Materials and Manufacturing Seed Grant Program*, (n.d.), available at <https://camm.utk.edu/wp-content/uploads/2024/05/CAMM-Seed-Grant-Program-Call-for-Proposals.pdf>.

University of Michigan-Ann Arbor

The Center for Materials Innovations at Michigan is focusing on developing (1) new recyclable polymeric materials with self-healing properties that may find use in additive manufacturing and (2) new layered materials with customized nanoscale architectures to enable elusive quantum states for quantum information processing and the creation of materials whose properties can be regulated on demand.³⁵⁰ This center has no PREM award.³⁵¹

University of Illinois Urbana Champaign (UIUC)

The University of Illinois' Materials Research Science and Engineering Center³⁵² has a PREM partnership with the HBCUs Fisk University and Tennessee State University (TSU) to establish strategic research initiatives and exchange programs, embedded within a supportive framework that includes education, career development, and cross-institutional mentoring aimed at expanding access to “advanced materials facilities and training for underrepresented minority (URM) undergraduates.³⁵³ To increase the number of minority graduates prepared for material science careers, another goal is to “build recruitment pathways to increase the enrollment of URMs in materials-related graduate programs at TSU, Fisk, and UIUC.”³⁵⁴

³⁵⁰ NSF, *Award Abstract # 2309029 MRSEC: Center for Materials Innovations at Michigan* (2024), https://www.nsf.gov/awardsearch/showAward?AWD_ID=2309029&HistoricalAwards=false.

³⁵¹ NSF, *Awards Simple Search*, <https://www.nsf.gov/awardsearch/simple-search/>, (simple search: PREM, refine search by State: no Michigan listed).

³⁵² NSF, *Award Abstract # 2309037 Illinois Materials Research Science and Engineering Center (I-MRSEC)* (2024), https://www.nsf.gov/awardsearch/showAward?AWD_ID=2309037&HistoricalAwards=false.

³⁵³ PREM, *TSUFI PREM*, (2025), <https://prem-dmr.org/projects/2520>.

³⁵⁴ *Id.*