

Technical Training Programs and Workforce Readiness at Historically Black Colleges and Universities: A Systematic Literature Review

Glory Oluwanifemi Adeogun, Morgan State University

Glory Adeogun is a Research Assistant with the Sustainability and Resilient Infrastructure Engineering program at Morgan State University. She supports applied research initiatives through literature review, qualitative and quantitative analysis, and preparation of technical documentation. Her academic interests include sustainability, data-driven decision-making, and development-oriented finance.

Julius Ogaga Etuke, Morgan State University

Julius Ogaga Etuke is a seasoned civil engineer and Ph.D. Candidate in Civil Engineering at Morgan State University, where his research focuses on sustainable and resilient infrastructure engineering. With over 15 years of consulting and project leadership experience, primarily in Nigeria's infrastructure landscape, he brings a robust, practical perspective to academic inquiry. His doctoral research is at the cutting edge of transportation resilience, integrating virtual and augmented reality (VR/AR), climate adaptation modeling, and data-driven solutions to improve disaster preparedness and risk mitigation in complex transportation systems. As a COREN-registered engineer and member of the Nigerian Society of Engineers, his work emphasizes impactful research and consultancy that bridges structural design principles with urgent sustainability and resilience challenges.

Dr. Olushola V. Emiola-Owolabi, Morgan State University

Olushola Emiola-Owolabi is an engineering pedagogy specialist, researching active learning in engineering classrooms and specializing in qualitative methods research on teaching and learning – particularly in remote synchronous learning environments.

Dr. Oludare Adegbola Owolabi P.E., Morgan State University

Dr. Oludare Owolabi, a professional engineer in Maryland, joined the Morgan State University faculty in 2010. He is the director of the Sustainable Infrastructure Development, Smart Innovation and Resilient Engineering Research Lab, Department of Civil Engineering at Morgan State University

Dr. Uttam Gaulee

Wisdom Etabiese UKUEJE, Morgan State University

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Abstract

Technical training programs at Historically Black Colleges and Universities (HBCUs) play a crucial role in equipping students for careers in high-demand technical fields. The demand for HBCU graduates rose by an average of 5.9% between 2016 and 2019, while non-HBCU graduates saw a 1.3% average increase. Graduates face barriers transitioning into the workforce when practical competencies and industry connections are limited.

This systematic literature review examines empirical and theoretical research published between 2000 and 2025 to evaluate how technical training initiatives at HBCUs contribute to workforce readiness. Guided by Human Capital Theory and Social Empowerment Theory, the review synthesizes findings from peer-reviewed articles, institutional reports, and conference proceedings using the PRISMA methodology. Thirty-one studies meeting the inclusion criteria were analyzed thematically across program design, skill outcomes, and institutional context.

The results indicate that technical programs improve student confidence, exposure to industry tools, and employment pathways when they integrate hands-on learning, mentoring, and applied experiences. However, capacity constraints, including aging infrastructure, limited faculty bandwidth, and financial barriers, restrict the scalability and impact of these initiatives. Findings suggest that the most effective programs combine technical skill development with culturally sustaining support structures unique to HBCUs.

The review concludes that sustained investment in facilities, faculty development, and structured industry partnerships is essential to aligning HBCU technical training with evolving labor market needs. This work contributes evidence to inform policymakers, academic leaders, and industry collaborators committed to strengthening workforce pipelines through HBCUs.

Keywords: Technical Training, Technical Education, Vocational Training, Career Readiness, Workforce Readiness, HBCUs

1. Introduction

1.1 Background

Career and Technical Education (CTE) technical training programs have changed from traditional vocational tracks to more difficult ones. The goal of these programs is to equip students with the academic, technical, and employability skills they need to succeed in fields such as healthcare, information technology, and infrastructure [1,2,3]. CTE closes the gap between what you learn in school and how you use it in real life by focusing on applied learning. CTE focuses on practical, competency-based education that combines technical skills with transferable abilities like problem-solving, collaboration, and critical thinking [1]. Empirical research demonstrates that involvement in comprehensive Career and Technical Education (CTE) programs diminishes dropout rates and markedly enhances long-term employment post-graduation [4,5].

Historically Black Colleges and Universities (HBCUs) are important in addressing skilled labor shortages in the U.S. job market by providing underrepresented groups more opportunities to gain experience and earn. HBCUs are important for social progress because they were set up to give Black Americans a chance to get a higher education when they were not allowed to go to mostly white schools. HBCUs account for only 3% of all U.S. higher education institutions, but they award about 25% to 27% of all Black STEM bachelor's degrees [6,7]. There was a 5.9% rise in demand for HBCU graduates from 2016 to 2019, while there was only a 1.3% rise in demand for non-HBCU graduates, this shows how important HBCUs are [8].

HBCUs provide not only academic instruction but also a culturally affirming environment that leverages mentorship from role models with similar backgrounds to bolster students' identity and motivation [3,9]. Now, HBCUs are increasing their technical capacity by forming strategic partnerships with businesses and establishing regional training centers in new fields such as computer engineering, biomanufacturing, and data science [10,11]. Still, not enough research has been done on how well these technical training programs prepare workers for a wide range of jobs. HBCUs are strong in STEM fields, but research shows they offer fewer postsecondary CTE options in areas such as natural resources and architecture than non-HBCUs do [3,5]. This could limit students' options for getting the unique social benefits of an HBCU education.

This Systematic Literature Review examines the innovative strategies employed by HBCUs to mitigate resource constraints and systemic obstacles, aiming to reduce the representation gap in the national and global technical workforce [11,12]. This review systematically examines research on technical training and workforce readiness at HBCUs, focusing on program types, teaching approaches, partnerships, and results. Its aim is to identify effective strategies to enhance HBCUs' role in developing a skilled and diverse workforce. Although there is increasing recognition of HBCUs' contributions to STEM education, there is still a limited systematic overview of how technical training programs lead to concrete workforce readiness outcomes, especially considering institutional capacity and resource disparities.

The study seeks to address the following objectives:

1. To assess the effectiveness of technical training programs at HBCUs in promoting workforce readiness.
2. To identify the institutional and structural factors that influence program success.
3. To examine how technical training aligns with broader goals of empowerment and equitable participation in the labor market.

By integrating existing research, this paper contributes to a deeper understanding of the strategic role of HBCUs in cultivating a technically competent, inclusive workforce prepared for the demands of a knowledge-based economy.

1.2 Statement of Problem

HBCUs occupy a paradoxical position in the American educational landscape. While they are responsible for producing a disproportionate share of the nation's minority technical talent, they offer significantly fewer Career and Technical Education (CTE) options than non-HBCU institutions [6,7]. Recent studies show that less than 25% of HBCUs offer common technical programs, and almost 25% of all CTE industries are not represented at all in these schools [3]. Because there are not enough technical training programs, students must choose between the culturally affirming environment of an HBCU and the specialized technical training offered at schools that do not serve minorities. This gap has effects on the larger job market, where Black

and African American workers are still underrepresented in more than half of U.S. CTE industries [3].

The lack of formal technical infrastructure manifests as a tangible disadvantage for students in high-growth fields. In emergency medicine, for example, the absence of dedicated academic departments at medical HBCUs results in a deficit of professional mentorship and formal curricula, leaving senior students at a competitive disadvantage during residency matches [14]. Similarly, in emerging sectors such as biomanufacturing, students face significant barriers to entry due to limited industry awareness and insufficient access to direct training facilities [10]. These institutional gaps are often exacerbated by chronic underfunding and a lack of resources compared to predominantly white institutions (PWIs), alongside student-level obstacles such as the need for sustained paid employment, heavy course loads, and a lack of childcare or transportation [3, 15, 16, 17]. Furthermore, attempts to implement extracurricular technical training, such as robotics or coding, are frequently hindered by scheduling conflicts and the challenge of tailoring instruction to students with diverse levels of prior technical experience [7].

As a result, many HBCU students graduate with solid theoretical knowledge but lack the practical skills and certifications that are increasingly needed in fields such as data analytics and advanced manufacturing [11, 18]. Despite the urgent need to align with the digital economy, there is still limited systematic research on the effectiveness and challenges of HBCU technical initiatives [12, 13]. This study aims to fill this gap by examining the transformative potential of HBCU technical programs through two perspectives: Human Capital Theory, which views specialized training as a vital economic investment for both individual and national growth [19, 20], and Social Empowerment Theory, which considers skill development a key way to enhance self-efficacy and community agency among marginalized groups [7, 21]. By exploring systemic barriers and successful models within these institutions, this research seeks to guide policy making and funding priorities to boost HBCUs' ability to prepare a diverse workforce for today's economy.

1.3 Research Questions

To address these critical gaps, this study is guided by the following research questions designed to evaluate the intersection of institutional capacity and student outcomes:

- What is the impact of technical training programs at HBCUs on students' workforce readiness?
- What barriers and enablers influence the success of technical training programs at HBCUs?
- What specific institutional policy changes are required to optimize the impact of technical training programs on workforce development at HBCUs?

2 Methodological Framework

2.1 Methodology

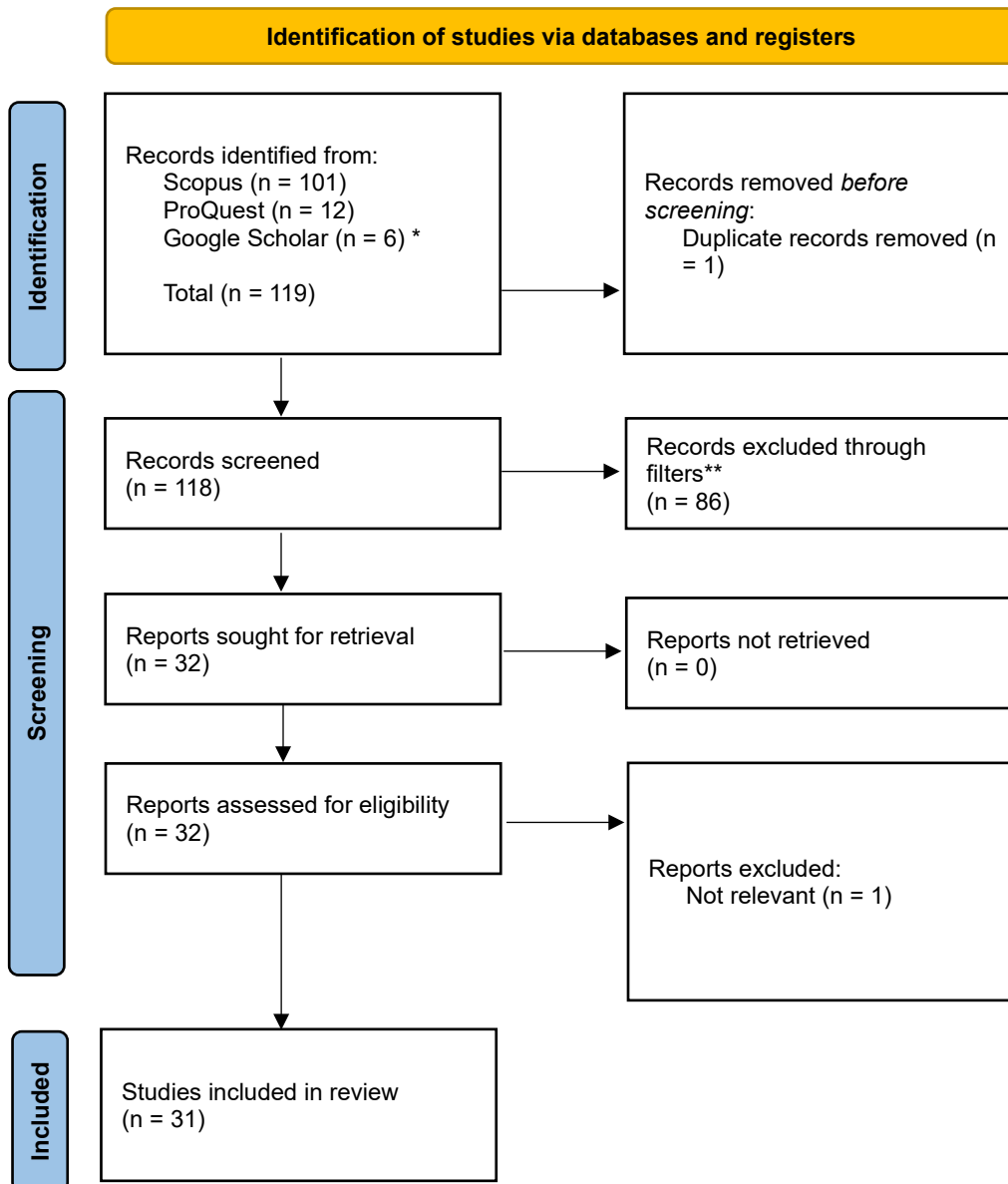
This study examines the intersection of technical training programs and workforce readiness, particularly within the context of Historically Black Colleges and Universities (HBCUs) in the United States. The review analyzes literature published between 2000 and 2025, a period that captures the rapid evolution of workforce development strategies during the era of digital transformation [3, 12]. To provide a thorough synthesis, the review incorporates peer-reviewed journal articles, institutional reports, policy briefs, and dissertations that focus on curriculum design, skill acquisition, industry partnerships, and graduate outcomes [6, 11].

The scope of this study is intentionally limited to secondary data sources, relying on published research and publicly available documentation. Research focusing on general higher education institutions or vocational schools without specific reference to the HBCU context is excluded to maintain relevance to the institution [2]. Furthermore, while the analysis emphasizes undergraduate and continuing education programs, it excludes graduate-level research training and purely theoretical studies that do not engage with technical skills. This targeted approach ensures that the findings remain firmly rooted in the unique mission and systemic challenges faced by the HBCU system [3, 7].

2.2 Review Methodology

This study employs a Systematic Literature Review (SLR) guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework [22]. The PRISMA approach provides a structured four-phase flow, identification, screening, eligibility, and inclusion, which ensures transparency, replicability, and rigor in the synthesis of literature.

The use of a systematic framework mitigates researcher bias and provides a clear audit trail of how evidence was gathered to address the study's core research questions [22, 23].



* Google Scholar searches employed predefined keywords as a secondary search method. To maintain relevance, only the top 200 results sorted by relevance were reviewed, aligning with practices from previous systematic reviews.

2.3 Search Strategy

Electronic databases including Scopus, ProQuest, and Google Scholar were systematically searched using combinations of the following keywords: “*technical training*,” “*workforce readiness*,” “*HBCUs*,” “*career preparedness*,” “*digital skills*,” and “*STEM education*.” Boolean operators (“AND”, “OR”) were used to refine results. The search covered studies published between 2000 and 2025, reflecting contemporary discussions on workforce development and educational innovation.



Figure 1: Number of Journals reviewed per database ($n = 31$)

2.4 Inclusion and Exclusion Criteria

The initial database search yielded approximately 116 studies. After duplicate removal and title/abstract screening, 115 studies remained. A full-text review narrowed these to thirty-one eligible sources, which were assessed for relevance, methodological soundness, and thematic alignment.

Studies were included if they:

- Focused on HBCUs or minority-serving institutions offering technical or workforce-oriented programs.
- Provided empirical data or theoretical discussions related to workforce readiness outcomes.
- Were published in English and accessible in full-text form.

Studies were excluded if they:

- Focused solely on traditional academic programs without a technical training component.
- Addressed general higher education without specifying HBCUs.
- Were commentaries, opinion pieces, or incomplete reports lacking methodological rigor.

Figure 2 shows the inclusion and exclusion criteria used during the screening process.

Database	Search Query Used	Date Search	Initial Records Identified	Filters	Records Identified after Filters	Duplicates Removed	Records Screened
SCOPUS	Technical Training Programs OR Technical Programs OR vocational education OR technical education OR training programs AND HBCU.	27-Oct-25	101	Year: 2000-2025. Document type: Articles, Conference Papers. Language: English. Keywords: Technical Training Programs, Technical Programs, vocational education, technical education, training programs, HBCU. Country: United States. Source type: Journal, Conference Proceedings. Open Access: All open access.	16	1	15
PROQUEST	((("technical training" OR "technical training program" OR "vocational education" OR "technical and vocational education") AND ("workforce readiness" OR "career preparedness" OR "workforce development") AND ("Historically Black Colleges and Universities" OR HBCUs))	24-Oct-25	12	Year: 2000-2025. Keywords: Technical Training Programs, Technical Training, Vocational Education, Workforce Readiness, Career Preparedness, Workforce Development, Historically Black Colleges and Universities, HBCUs. Document type: Article. Language: English. Location: United States. Limit to: Peer reviewed.	11	1	10
GOOGLE SCHOLAR	Technical Training Programs OR Technical Programs OR vocational education OR technical education OR training programs AND HBCU.	20-Dec-25	20	Year: 2000-2025. Keywords: Technical Training Programs, Technical Training, Vocational Education, Historically Black Colleges and Universities, HBCUs. Document type: Article. Language: English. Location: United States. Limit to: Peer reviewed.	6	0	6
TOTAL			133		33	2	31

Figure 2: Inclusion and Exclusion Criteria

2.5 Data Extraction and Analysis

Data from selected studies were extracted using a structured review matrix capturing author(s), publication year, research design, institutional focus, program characteristics, key findings, and limitations.

Thematic analysis was conducted to identify recurring patterns across three dimensions:

1. **Program Design and Delivery** – curriculum models, partnerships, and instructional approaches.
2. **Workforce Readiness Outcomes** – employment rates, skill acquisition, and student perceptions.
3. **Institutional Challenges and Enablers** – funding, infrastructure, and stakeholder collaboration.

This structured methodology ensures that findings are both evidence-based and reflective of the unique contributions of HBCUs to technical skill development and workforce equity.

2.6 Theoretical Framework

This study is guided by Human Capital Theory and Social Empowerment Theory, which together provide a structured analytical framework for examining how technical training programs at Historically Black Colleges and Universities (HBCUs) contribute to workforce readiness outcomes. Rather than serving solely as conceptual backgrounds, these frameworks inform the processes of data extraction, coding, and synthesis within the systematic literature review.

Human Capital Theory conceptualizes education and training as investments that enhance individuals' productivity, skills, and labor market outcomes [19, 19, 19,20]. In this study, it is used to assess how technical training programs influence measurable indicators of workforce readiness, such as skill acquisition, employment outcomes, industry alignment, and certification attainment. During data extraction, studies were coded for evidence of human capital development, particularly where programs demonstrated direct links between technical training and employability outcomes [5, 11].

Conversely, Social Empowerment Theory underscores the role of education in fostering self-efficacy, identity formation, and agency among individuals, especially within historically marginalized groups [21]. This framework is particularly pertinent in the HBCU context, where culturally affirming environments, mentorship structures, and institutional support systems significantly influence student experiences and outcomes [7, 9]. Accordingly, studies were also coded for indicators of empowerment, including mentorship, student engagement, confidence development, and perceived readiness for professional environments.

Integrating these two theoretical frameworks enables a dual- dimensional analysis of workforce readiness. While Human Capital Theory captures the economic and skills- based outcomes of technical training, Social Empowerment Theory offers insights into the social and psychological mechanisms that support or hinder these outcomes. This comprehensive approach helps identify interactions among institutional capacity, student development, and labor market preparedness, particularly within resource- constrained settings such as HBCUs [3, 12].

3 Results

3.1 Research Attributes Across Journal Articles

The publication dates of the reviewed literature were analyzed by journal publication count per year. Results indicated that specific technical training programs relating to HBCUs were limited. With growing interest in HBCU graduates, their technical quality has increased over the years across various training programs in different industries. This is reflected in Figure 5 by the steady increase in technical training programs at HBCUs in the United States, with the highest number of journal articles published from 2020 to 2025.

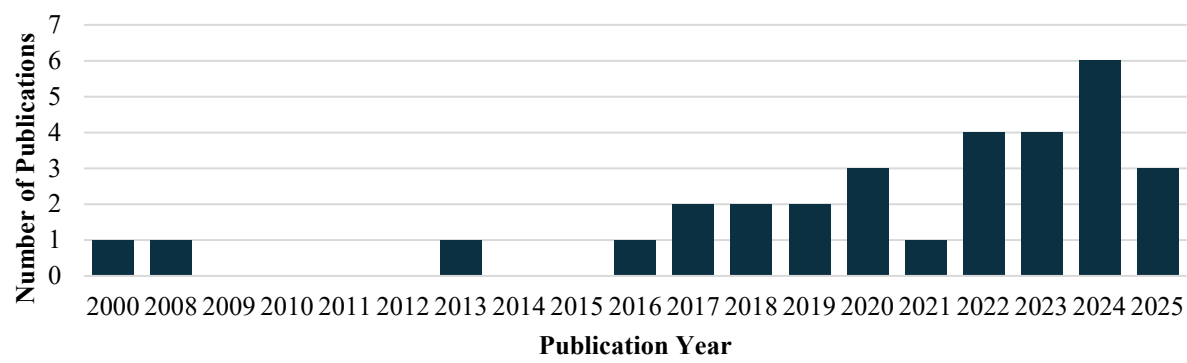


Figure 5: Number of journal articles reviewed by publication year (n=31)

The journals reviewed are not all journal articles; some fall under the categories of conference papers, systematic reports, and institutional reports, as shown in Figure 6. Journal articles constituted 87% of all papers reviewed, with 7% conference papers and 3% systematic reports.

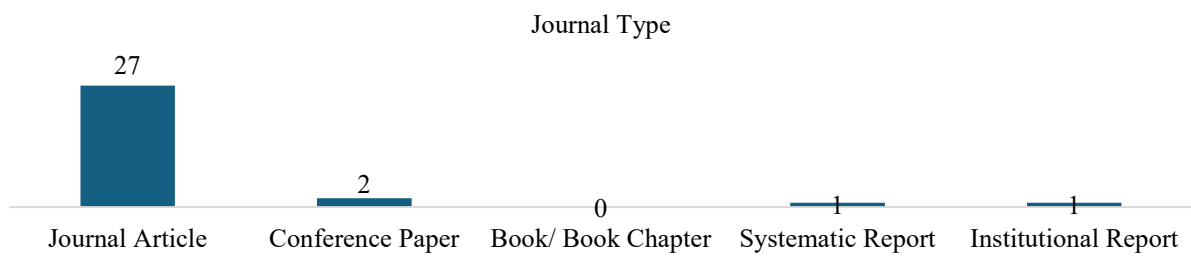


Figure 6: Number of journal articles reviewed by journal type (n=31)

Each of these journal articles uses a different research methodology. The primary method was qualitative analysis, as shown in Figure 7. Studies used research methods including mixed

methods (20%), narrative review (13%), systematic review (3%), quantitative analysis (30%), and qualitative analysis (33%).

The mixed-methods approach combines quantitative data collection with qualitative insights, including surveys for descriptive analysis, thematic analysis, stakeholder interviews, and quantitative post-curricular surveys to measure impact. Narrative and systematic reviews focused on existing literature reviews by reviewing and screening many studies. Quantitative analysis involves statistical modeling and data-driven assessments to identify trends and predict success. Qualitative analysis explores lived experiences, perceptions, and institutional philosophies, including semi-structured interviews, content analysis, and multi-case studies.

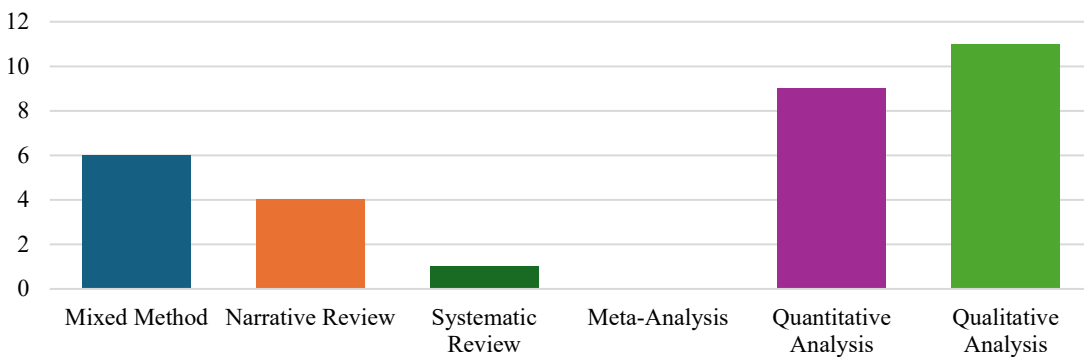


Figure 7: Research methodology used in reviewed journal articles (n=31)

3.2 Geographical Distribution

Most of the studies are situated in the United States, as indicated in Figure 8, with a “Yes” response, representing 90% of the total studies conducted in the US alone. The remaining 10%, which is three studies, focused on analysis based in Europe, Canada, and Australia. As this research focuses on technical training programs in HBCUs, Figure 9 shows that 26% of the study focused only on HBCUs, 32% on a mixture of HBCUs, PWIs, and High schools, and 42% on high schools and community colleges.

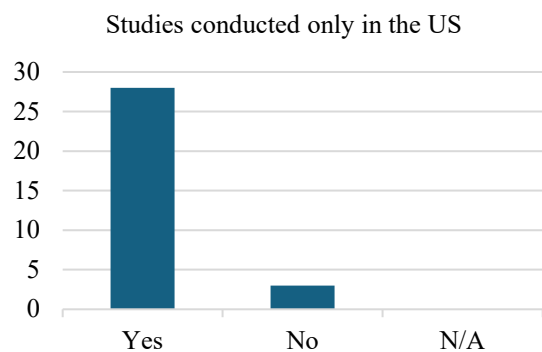


Figure 8: No. of studies conducted only in the US in reviewed journal articles (n=31)

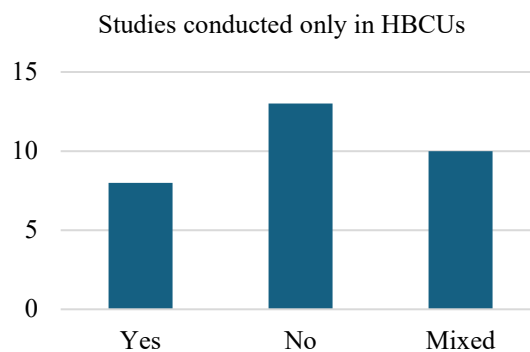


Figure 9: No. of studies conducted only in HBCUs in reviewed journal articles (n=31)

For the HBCUs specifically highlighted in each study/research, Figure 10 lists all institutions and their frequency of mention across the studies. The most frequently mentioned HBCU is Howard University, with a frequency of 9, or 13%. One study compares the CTE pathway at HBCUs across 100 institutions with a matched sample of 100 non-HBCUs; this is represented as Others [3].

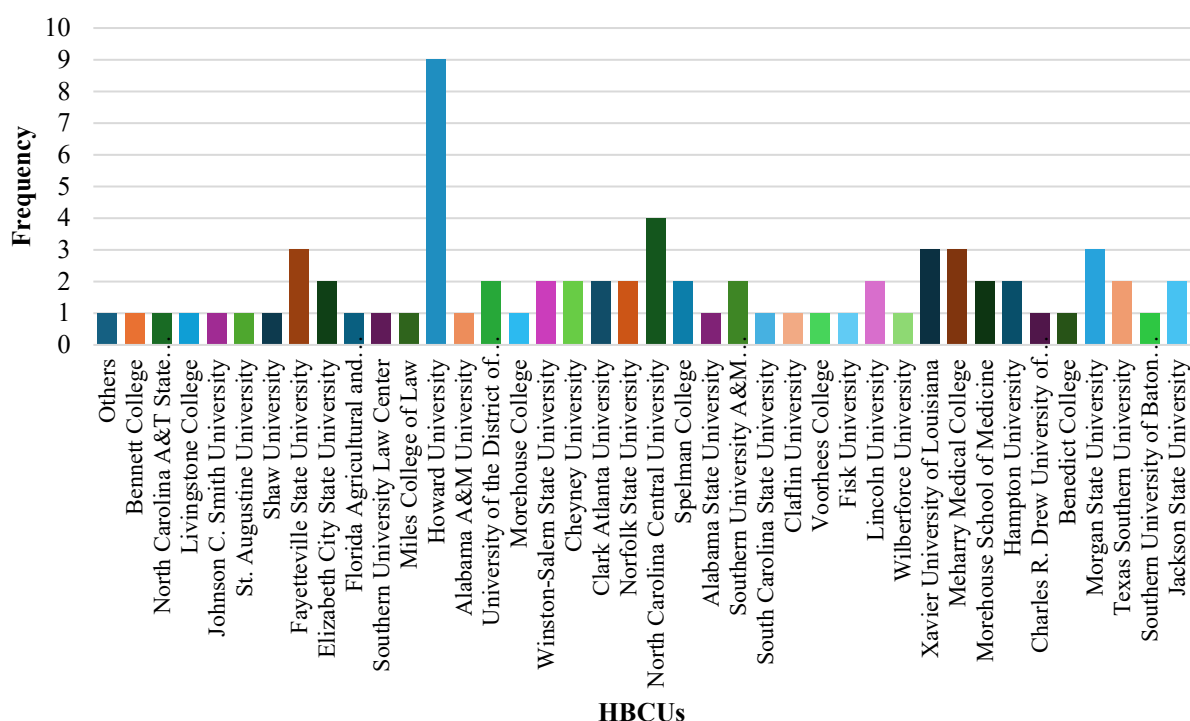


Figure 10: Number of HBCUs mentioned in reviewed journal articles

3.3 Technical Training Themes Across Journal Articles

Technical training programs in the reviewed journals span diverse professional fields, including data science, biomanufacturing, secondary career and technical education (CTE), and law school clinics, among others listed in Figure 11. The Secondary Career and Technical Education (CTE) program accounts for 16% of all journals, while the remaining journals span data science, engineering, biomanufacturing, health sciences, and other humanities [10,11,13].

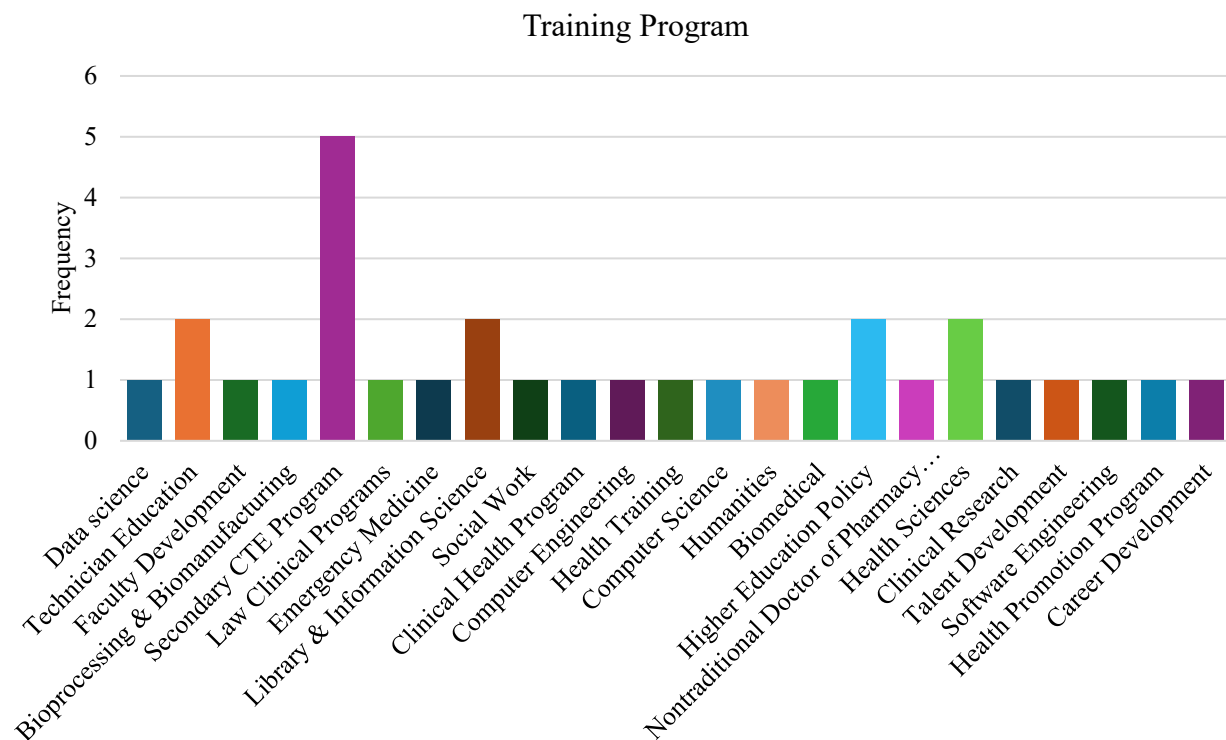


Figure 11: Number of training programs focused on reviewed journal articles (n=31)

Lack of resources, including shortages of teachers, systemic underfunding, and even disparity in funding between HBCUs and PWIs, are institutional barriers faced by HBCUs concerning technical programs [3,11,15].

Figure 12 shows the organizations that funded the programs mentioned in the studies. Some studies have more than one funding organization, which explains the increased total. About 30% of the journal articles lacked funding, either because of the nature of the research or because no funding was available, especially external funding. The National Science Foundation (NSF) is a popular source of funding for universities, funding about 13% of programs, while the National

Institutes of Health funds about 7%. Also, some of these programs received industry funding from companies like Amgen, Novo Nordisk, AstraZeneca, Merck, and Google, which accounted for about 11% of the journal articles.

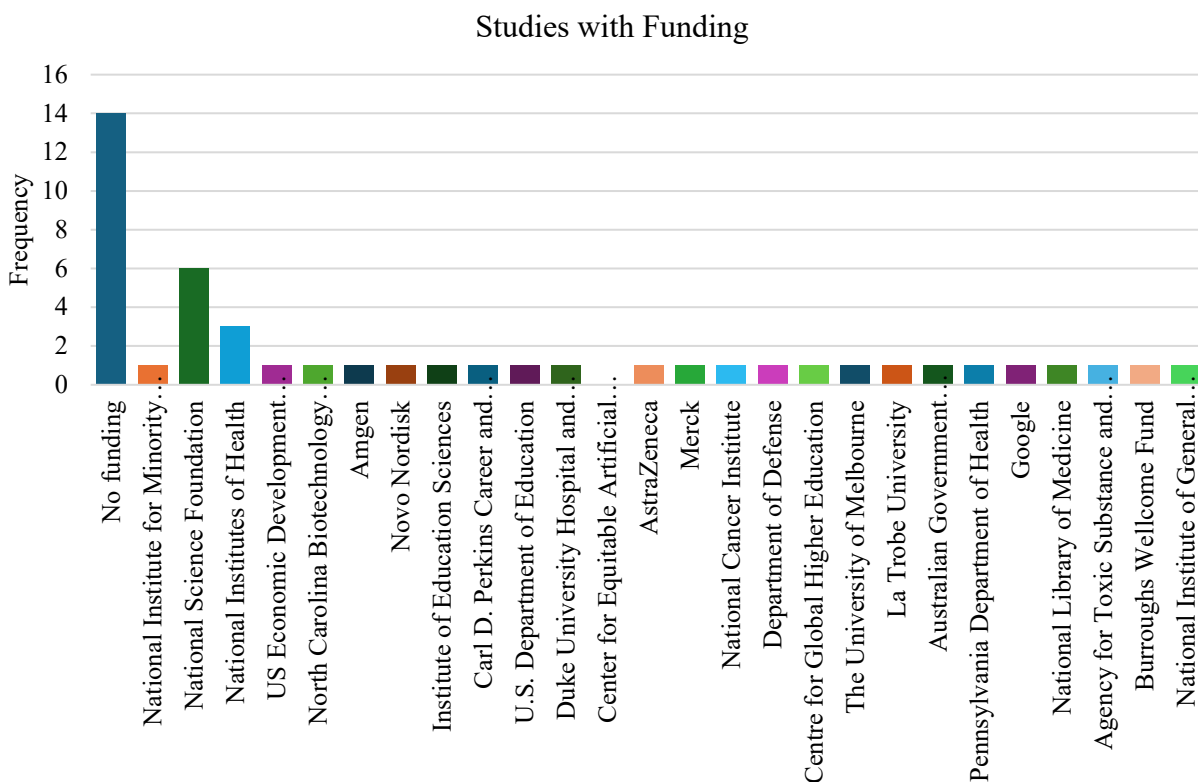


Figure 12: Number of HBCUs mentioned in reviewed journal articles

Taken together, the reviewed studies reveal three recurring constraints that limit the effectiveness of technical training programs at HBCUs: insufficient physical and technological resources, limited faculty capacity to lead program development beyond instructional duties, and student-level challenges such as financial pressure and competing time demands [3,15,17]. These barriers create a persistent gap between student interest and institutional ability to provide direct, industry-aligned training, demonstrating that while motivation and talent are present, the supporting infrastructure required to sustain high-quality technical preparation remains inconsistently developed across HBCUs.

4 Discussions

The findings of this systematic review suggest that technical training at HBCUs functions as a dual- force mechanism. When examined through the framework of Human Capital Theory, the data confirm that HBCUs are highly effective at producing technical capital, particularly within STEM disciplines, owing to their contribution to the number of Black bachelor's degrees awarded in the nation [3,6]. Nevertheless, the capital generated is frequently jeopardized by institutional resource deficiencies. The lack of dedicated CTE departments in nearly 25% of industries represented by HBCUs results in a ' capital deficit,' where students demonstrate theoretical competence but lack the industry- standard certifications and practical experience necessary for immediate employment in high- growth sectors such as biomanufacturing [3, 10].

Simultaneously, the findings substantiate Social Empowerment Theory as an essential aspect of the "HBCU Effect." Literature consistently highlights culturally affirming mentorship as a primary " enabler" of student achievement [7]. This environment transforms technical training from a mere economic transaction into a process of identity formation. Students are not only developing skills but also acquiring self-efficacy, which is vital for navigating professional spaces where their representation remains limited. The increasing demand for HBCU graduates [8] indicates that the labor market is progressively recognizing the value of this constructive collaboration between technical competence and cultural resilience.

Nevertheless, a notable tension exists between these two theoretical frameworks. While Social Empowerment Theory is highly active within the HBCU setting, external barriers- such as chronic underfunding and students' socio- economic challenges (including transportation, childcare, and the necessity for paid employment)- impede the full realization of Human Capital Theory objectives [15,17]. To enhance workforce readiness, institutional policies must address this gap by implementing paid technical apprenticeships and upgrading infrastructure. Such measures would ensure that the social empowerment fostered by HBCUs is complemented by the technical rigor required by the global digital economy.

5 Conclusion and Recommendations

The rapid evolution of the industrial landscape has transformed technical training into a vital catalyst for economic resilience. The so-called "skills gap" signifies not merely a deficiency of specialized knowledge but also a misalignment between conventional educational paradigms and the progressively sophisticated demands of a high-technology workforce.

As automation and artificial intelligence redefine occupational roles, workforce preparedness must be evaluated beyond singular credentials or sporadic training initiatives. Genuine readiness entails integrating technical competencies with essential soft skills, such as critical thinking and adaptability, within a framework of continuous learning.

Despite obstacles such as fragmented funding and digital disparities, technology-enhanced training presents a viable trajectory forward. The vitality of the labor market depends on a collaborative effort among educational institutions, industry leaders, and policymakers to regard human capital development as a collective investment. Without this transition, the gap between technological advancement and workers' capabilities will widen, threatening individual career mobility and national competitiveness.

To optimize the impact of technical training at Historically Black Colleges and Universities (HBCUs) and to address the persistent workforce readiness gap, the following institutional and policy modifications are recommended:

1. Federal and State Funding Realignment: Policy should shift from general appropriations to targeted grants aimed at enhancing technical infrastructure. Priority should be given to "Smart Hubs" and centralized laboratories for data science, biomanufacturing, and robotics to ensure that HBCU facilities reflect the environments of high-growth industries [10,12].

2. Expansion of Integrated Apprenticeships: To mitigate socio-economic barriers, such as the necessity for paid employment, institutions should adopt "Earn-and-Learn" models. Collaborations with industry leaders to offer remuneration, credit-bearing apprenticeships will serve both economic needs and professional networking objectives [15].

3. Curricular Diversification and Certification Pathways: HBCUs are encouraged to strategically broaden their Career and Technical Education (CTE) offerings into

underrepresented sectors such as natural resources and advanced manufacturing. The integration of industry-recognized micro-credentials (e.g., AWS, Google, or Lean Six Sigma) into undergraduate programs will ensure graduates possess both theoretical knowledge and practical skills requisite for immediate integration into the labor market [3,13].

4. Sustained Research and Data Monitoring: There exists an urgent necessity for longitudinal tracking of HBCU technical graduates. Establishing a centralized data repository will enable policymakers to appraise the effectiveness of specific interventions, thereby ensuring that future funding is grounded in evidence and aligned with actual workforce outcomes [12].

By implementing these recommendations, HBCUs can bridge the divide between potential and participation, ensuring that their graduates are not only contributors to the global economy but also its leaders.

References

- [1] Brand, B., Valent, A., & Browning, A. (2013, March). How career and technical education can help students be college and career ready: A primer. College & Career Readiness & Success Center at American Institutes for Research.
- [2] Malkus, N. (2019). The Evolution of Career and Technical Education, 1982–2013. American Enterprise Institute
- [3] Williams, K. M., Belur, V., & Yang, Z. (2024). Examining career and technical education (CTE) pathways in historically Black colleges and universities (HBCUs). *Empirical Research in Vocational Education and Training*, 16(1), Article 11.
- [4] Kalejaiye, P. O. (2023). Addressing shortage of skilled technical workers in the USA: A glimpse for training service providers. *Future Business Journal*, 9(1), Article 50.
- [5] Lindsay, J., Hughes, K., Dougherty, S. M., Reese, K., & Joshi, M. (2024). What we know about the impact of career and technical education: A systematic review of the research. American Institutes for Research, Career and Technical Education Research Network.
- [6] Cain, C.C.; Morgan Bryant, A.J.; Buskey, C.D. (2018). The role of historically black colleges and universities in American STEM education. *SIGMIS Cpr 2018 Proceedings of the 2018 ACM SIGMIS Conference on Computers and People Research* pp. 134-137.
- [7] Hur, J. W., Thomas, C., Huang, L., & Chang, X. (2024). Improving Retention and Success of African American Students in Computer Science: A Mixed-Method Case Study at an HBCU. *Trends in Higher Education*, 3(4), 912–927.
- [8] Gray, M. J. (2021, February 11). *LinkedIn study shows HBCU grads bucking low U.S. hiring trends despite economic downturn*. BET. <https://www.bet.com/article/sfjhbm/study-shows-hbcu-grads-bucking-low-u-s-hiring-trends>
- [9] Thompson-Rogers, K., Davis, D. J., Davis-Maye, D., & Turner, C. (2018). Historically Black Colleges and Universities' Mentorship of Health Profession Students: A Content Analysis Exploring the North Carolina Health Careers Access Program. *IAFOR Journal of Education*, 6(2).

- [10] Allen, A. B., Smith, W. G., Navarro, H., & Onyenwoke, R. U. (2024). Building towards societal inclusion in the biomanufacturing workforce: A developing model in North Carolina. *Industry & Higher Education*.
- [11] Wang, Q., Gupta, V., Cao, A., Singhal, A., Gary, T., & Adunyah, S. E. (2023). A Case Study of Enhancing the Data Science Capacity of an RCMI Program at a Historically Black Medical College. *International Journal of Environmental Research and Public Health*, 20(6), 4775.
- [12] Akintobi, A., O'Hara, S., Harrison, E., & Brittain, J. (2025). Community Cornerstones: An Analysis of HBCU Law School Clinical Programs' Impact on Surrounding Communities. *Laws*, 14(4), 48.
- [13] Monestime, S., Thompson, E. L., Wilson, M., McCants, T., & Williams, L. B. (2025). Improving Lung Cancer Education and Screening Navigation Skills Among HBCU Health Trainees: A Pilot Study of Program CONNECT. *Journal of Cancer Education*.
- [14] Brown, C., Carter, R., Hartman, N., Hammond, A., MacNeill, E., Holden, L., Pierce, A., Campbell, L., & Norman, M. (2025). Effectiveness of a Collaborative, Virtual Outreach Curriculum for 4th-Year EM-bound Students at a Medical School Affiliated with a Historically Black College and University. *The Western Journal of Emergency Medicine*, 26(1), 129–134.
- [15] Hora, M., Chen, Z., Parrott, E., & Her, P. (2020). Problematizing college internships: Exploring issues with access, program design and developmental outcomes. *International Journal of Work - Integrated Learning*, 21(3), 235-252.
- [16] Quilliam, C., Crawford, N., McKinstry, C., Buccheri, A., & Brito, S. (2024). Study supports for rural mature-aged university health students: A stakian multicase study. *BMC Medical Education*, 24, 1-13.
- [17] Mincey, K., & Gross, T. (2017). Training the Next Generation: Developing Health Education Skills in Undergraduate Public Health Students at a Historically Black College and University. *Frontiers in Public Health*, 5, 274. <https://doi.org/10.3389/fpubh.2017.00274>
- [18] Ismail, Y, Okwan, P, Khalifa, F, et al. (2024). Improving the practical skills of STEM students at a historically black college and university (HBCU). *Journal of Infrastructure, Policy and Development*. 8(6): 3507.

- [19] Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.
- [20] Sweetland, S. R. (1996). Human capital theory: Foundations of a field of inquiry. *Review of Educational Research*, 66(3), 341–359.
- [21] Solomon, B. B. (1976). *Black empowerment: Social work in oppressed communities*. Columbia University Press.
- [22] Page, M. J., et al. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Systematic Reviews*, 10(89).
- [23] Moher, D., et al. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, 6(7), e1000097.
- [24] Rw, J., & Kornegay, R. (1999) The role of the historically black college and university (HBCU) in student learning.
- [25] Courington, D. (2021). Mask Off: Students’ of Color Traumatic Experiences in K-12 Education and Why Historically Black Colleges and Universities Make a Difference.
- [26] Graham, D. A. (2019). Benefits of Online Teaching for Face-to-Face Teaching at Historically Black Colleges and Universities. *Online Learning* (Newburyport, Mass.), 23(1), 144.
- [27] Ndumu, A. (2021). Shifts: How changes in the US black population impact racial inclusion and representation in LIS education. *Journal of Education for Library and Information Science*, 62(2), 137-161.
- [28] Crewe, S. E. (2017). Education with intent—The HBCU experience. *Journal of Human Behavior in the Social Environment*, 27(5), 360–366.
- [29] Willard, T. (2020). Let’s celebrate the humane in the humanities. *Humanities*, 9(3), 109.
- [30] Caffrey, C., Lee, H., Withorn, T., Clarke, M., Castañeda, A., Macomber, K., . . . Katie, P. K. (2022). Library instruction and information literacy 2021. *Reference Services Review*, 50(3), 271-355.
- [31] Ford, M. E., Abraham, L. M., Harrison, A. L., Jefferson, M. S., Hazelton, T. R., Varner, H., . . . Salley, J. D. (2016). Mentoring strategies and outcomes of two federally funded cancer

research [32] training programs for underrepresented students in the biomedical sciences. *Journal of Cancer Education*, 31(2), 228-235.

[33] Dougherty, K. J., & Natow, R. S. (2020). Performance-based funding for higher education: How well does neoliberal theory capture neoliberal practice? *Higher Education*, 80(3), 457-478.

[34] Karodeh, Y. R., Wingate, L. T., Drame, I., Talbert, P. Y., Dike, A., & Sin, S. (2022). Predictors of Academic Success in a Nontraditional Doctor of Pharmacy Degree Program at a Historically Black College and University. *American Journal of Pharmaceutical Education*, 86(10), Article ajpe8600.

[35] Lent, M. R., Gaither-Hardy, D., Favor, K. E., Harris, D., Cos, T. A., Millard, C., Kone, Z., Van Riper, A., & Dugosh, K. L. (2023). The development, implementation and early learnings of a training program to advance interest in behavioral research careers among undergraduate BIPOC students majoring in psychology. *BMC Medical Education*, 23(1), Article 160.

[36] Rajasekar, J., Al-Asfour, A., & Boomer, H. (2023). Talent development for faculty: The case of higher education minority-serving institutions. *The Journal of Faculty Development*, 37(1), 41-50.

[37] Walker, B., & Spann, M. (2008). The need for diversity in the environmental health workforce. *Journal of Health Care for the Poor and Underserved*, 19(1), 16-25.

[38] Gittell, M., & Kleiman, N. S. (2000). The political context of higher education: PROD. *The American Behavioral Scientist*, 43(7), 1058-1091.

[39] Ramadoss, D., Bolgioni, A. F., Layton, R. L., Alder, J., Lundsteen, N., Stayart, C. A., . . . Varvayanis, S. S. (2022). Using stakeholder insights to enhance engagement in PhD professional development. *PLoS One*, 17(1)

[40] Delahanty, C., & Genis, V., & Herring, S., & Timby, T. (2022, August), *Innovative Curriculum: Collaboration Between Technician Education and Workforce Development* Paper presented at 2022 ASEE Annual Conference & Exposition, Minneapolis, MN.