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Examining the Impact of Integrating Continental and Diasporic African STEM Achievements into HBCU Engineering Curriculum (Evaluation)

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Morgan State University student Mr. Kendal Knox is pursuing a Bachelor's degree in Electrical and Computer Engineering. His interest in engineering was sparked through early exposure to STEM programming during middle and high school. Mr. Knox now serves as an instructor for Conscious Ingenuity, a program founded by Dr. DeAnna Bailey to increase Black participation in engineering through early exposure to engineering education and literacy. In recognition of his dedication to teaching and mentorship, Mr. Knox was awarded the Outstanding Instructor of the Year Award from Conscious Ingenuity.

Mr. Knox's research focuses on examining the impact of integrating African-centered approaches into engineering education, an area in which he has co-authored three publications. Through conducting research under the mentorship of Dr. Bailey, he discovered a passion for both research and teaching, particularly in developing meaningful and culturally affirming STEM learning experiences for youth. Mr. Knox aspires to continue advancing engineering education through innovative teaching practices, impactful research, and community-centered engagement.

Examining the Impact of Integrating Continental and Diasporic African STEM Achievements into HBCU Engineering Curriculum

Abstract

This paper presents findings from an exploratory qualitative case study examining the effects of integrating Continental and Diasporic African STEM achievements into an Historically Black College and University (HBCU) engineering curriculum on African-descended students' views and interpretations of STEM, motivation, and engineering identity. The study also investigates how African-descended students understand the goals of this integration and assess its value and influence within their engineering education. The study investigates three research questions: How well do African-descended students demonstrate an understanding of the goals of their exposure to Continental and Diasporic African STEM achievements? How does exposure to this content influence African-descended students' views and interpretations of STEM, motivation, and engineering identity? How do African-descended students evaluate the relevance and effectiveness of lectures centered on Continental and Diasporic African STEM achievements within engineering education? To address these research questions, a qualitative case study design was employed. The study draws on written reflections from 101 undergraduate engineering students at Morgan State University who were exposed to a forty-five-minute lecture highlighting Continental and Diasporic African STEM Achievements between Fall 2024 and Fall 2025. Students responded to prompts reflecting on the lecture's objectives, content, impact, and value. Student reflections were analyzed using deductive coding and interpreted through the African-Centered STEM Education (ACSE) model developed by Dr. DeAnna Bailey. Findings indicate that students demonstrated a moderate understanding of the lecture objectives. The lecture broadened students' awareness of Continental and Diasporic African innovation and shifted their views and interpretations of the STEM field. Students also reported feelings of pride and motivation, a renewed or deepened connection to their cultural identity, and a desire for this knowledge to be shared with others. This paper describes the lecture, discusses the African-Centered STEM Education model, details the study's research methods, presents key findings, and discusses the implications and conclusions.

Keywords: Black engineers, African American engineers, African STEM achievements, STEM education, African-Centered Education, African-Centered STEM Education model

Introduction

Although the advancement of Science, Technology, Engineering, and Mathematics (STEM) is a collective human endeavor, traditional STEM education is shaped by Eurocentric historical and epistemological framings that often foreground European achievements in these fields. Prior scholarship has shown that STEM curricula disproportionately emphasize laws, theories, and historical accounts attributed to European figures, resulting in the limited visibility of non-European achievements, particularly those of Continental and Diasporic Africans. According to scientific consensus, humanity originated and evolved in Africa, with early human populations developing and expanding there prior to global dispersal (Groucutt et al., 2015). Such expansion would not have been possible without sustained African innovation over millions of years, which was essential to human survival and adaptation. Despite this legacy—and extensive evidence of innovation within classical African civilizations demonstrating that their indigenous knowledge systems encompassed scientific thinking, mathematical knowledge, and advancements in engineering and technology—Continental African achievements remain largely invisible in traditional STEM curricula.

Similarly, Diasporic African achievements, particularly those of African Americans, are frequently omitted despite continuous innovation following their forced migration to America.

By consistently centering European achievements as the primary reference point for STEM knowledge and practice, traditional STEM education normalizes Eurocentric orientations that shape how students view and interpret STEM, and their place within it.

Carter G. Woodson (1990) recognizes the necessity and value of African history, both Continental and Diasporic, being ingrained in the education of Black American students. He criticizes institutions educating Black Americans at the time—whom he referred to as “Negro Colleges”—for failing to embed African history across their academic disciplines. He contends that the inclusion of African history within academic disciplines supports Black American students’ self-understanding, purpose, and sense of worth, thereby strengthening their engagement with learning. Woodson also notes that successful educators center the culture of their students within the learning experience. Essentially, he was describing a culturally grounded education characterized by pedagogical practices and learning experiences that affirm cultural identity and cultivate purpose, dignity, and self-determination among Black students. This vision parallels an educational orientation that would later be theorized as culturally relevant pedagogy—an approach that promotes academic success, cultural competence, and critical consciousness by Gloria Ladson-Billings (1995, 2014). At the instructional level, this same orientation aligns with culturally responsive teaching, which emphasizes using students’ cultural knowledge and histories as assets for learning (Gay, 2018). Culturally sustaining pedagogy also connects to this orientation by moving beyond inclusion to sustain students’ cultural and linguistic identities as resources for learning within educational spaces. This approach supports the preservation of these identities and positions them as central to inclusive learning and broader social transformation (Paris & Alim, 2017).

Although many Historically Black Colleges and Universities (HBCUs) today offer

Black/Africana Studies programs, other academic fields, such as science, mathematics, and engineering, still largely exclude African history as it relates to those subjects. This qualitative case study investigates the impact of integrating Continental and Diasporic African STEM achievements into the engineering curriculum on African-descended engineering students at an HBCU. The study draws on students' reflection papers, written after exposure to these achievements, to examine the effects of this curricular integration. Findings revealed that exposing African-descended engineering students to Continental and Diasporic African STEM achievements led them to reinterpret STEM—its definitions, knowledge, and utility; increased their interest, confidence, and motivation in STEM—both in the field itself and in their pursuit of engineering degrees; enhanced their sense of belonging in engineering; and strengthened their ancestral connection while increasing their cultural pride. The subsequent sections discuss the functions and value of history, present the theoretical framework guiding the study—the African-Centered STEM Education (ACSE) model, outline the research methodology, report key findings and emergent themes, and conclude with a discussion of the study's implications and limitations.

The Functions and Educational Value of History

History is often understood as a recounting of past people, places, and events. However, scholars have explained that history is far more than this. In this paper, history is defined as the collective record and interpretation of human experiences and conceptualized as functioning in four ways: (1) it supports self-understanding and offers models of possibility and action; (2) it explains the present state of the world—knowledge of the past clarifies how current conditions and systems came into being; (3) it enables individuals and communities to make informed decisions by drawing lessons from past successes, failures, and patterns of action; and (4) it provides predictive power that can be used for empowerment, allowing people to anticipate outcomes and intentionally shape their futures in ways that advance their communities and collective well-being. Together, these functions point to the broader value of studying history, as they reveal how historical knowledge supports understanding, informed decision-making, and empowered action. Consistent with this framing, Woodson (1990) contends that studying history enables individuals to develop a deeper understanding of themselves and to recognize the possibilities available to them for meaningful action in the present - not to imitate people of the past, but to internalize their spirit in order to do what needs to be done in the present. Extending this perspective, Wilson (2014) argues that studying history allows people to understand the foundations that shape their identity and consciousness. He emphasizes that history is directly linked to culture and personality, such that when history is controlled or distorted, it reshapes how people think, behave, and understand themselves.

In educational settings, history functions as more than content to be learned. Within this context, three key functions of history are evident. History can foster a connection between students and an academic discipline. Seeing meaningful representations within the field allows students to recognize themselves as part of the discipline—belonging to it and having a stake in it—rather than as passive recipients of its content. Historical knowledge also provides learners an opportunity to understand how their ancestors and culture perceived and participated in the discipline. Such understanding anchors students' interpretation of the field in their culture, enabling them to view and engage with the discipline through their cultural lens. Exposure to these histories further reveals students' potential roles within academic and professional fields. In turn, this recognition encourages students to envision themselves as capable contributors to advancement within the discipline. This qualitative case study provides empirical support for these functions, along with previous studies highlighted in the subsequent section.

Related Empirical Studies

STEM educators have increasingly called for the inclusion of Continental and Diasporic African STEM achievements within formal STEM curricula, and several researchers have examined the impact of this inclusion on African American students. For example, the Cybersecurity Assurance and Policy (CAP) Center at Morgan State University utilizes African American women's achievements in STEM as a culturally responsive teaching strategy within its Cyber Stars Program to encourage middle school African American female participation in cybersecurity—an approach associated with increased interest, engagement, and learning (Bailey, Kornegay, & Partlow, 2024; Bailey, Partlow, & Bowens, 2024). Similarly, the Uhuru Academy Conscious Ingenuity (UACI) STEM Camp incorporates historical and contemporary Continental and Diasporic African achievements to increase K–12 African-descended students' interest and engagement in STEM, build confidence, and inspire participation, while affirming their potential to succeed, strengthening cultural identity, and encouraging diverse ways of practicing STEM, including applying STEM knowledge toward community empowerment (Bailey and Ojuok, 2024; Bailey, Rotindo & Ojuok, 2025). Program findings suggest increases in students' interest, confidence, knowledge—both self-reported and demonstrated—and self-efficacy in STEM. The Conscious Ingenuity program highlights a historical and contemporary Continental and Diasporic African STEM achievement at the beginning of each engineering session and reports that this inclusion resulted in high levels of student engagement, increased confidence, growing interest, and a more developed STEM identity. (Bailey, Rotindo & Knox, 2025)

This qualitative case study builds on this work by examining the effects of similar exposure among African-descended students enrolled at a Historically Black College and University (HBCU). The study analyzes 101 student reflection papers using deductive coding, interpreted through the African-Centered STEM Education (ACSE) model, and guided by the following research questions: How well do African-descended students demonstrate an understanding of the goals of their exposure to Continental and Diasporic African STEM achievements? How does exposure to this content influence African-descended students' interpretations of STEM, motivation, and engineering identity? How do African-descended students evaluate the relevance and effectiveness of lectures centered on Continental and Diasporic African STEM achievements within engineering education?

Continental and Diasporic African STEM Achievements Lecture

The participants in this qualitative case study were exposed to a lecture entitled *STEAM: What Africans Brought to the Table*, created and presented by Mr. Robert West, a science advocate and communicator. This lecture presents Continental and Diasporic Africans as historically innovative and central to scientific and technological advancement. The lecture aimed to increase students' awareness of Continental African indigenous knowledge and innovations alongside Diasporic African STEM achievements–particularly those of African Americans; broaden students' conceptions of STEM knowledge, advancement, and achievement by presenting a more inclusive account of STEM history and development that recognizes the contributions of African peoples and knowledge systems often omitted from dominant STEM narratives; foster connections between students' cultural identity and STEM disciplines; and support students' motivation and self-efficacy in STEM, particularly engineering.

The lecture drew from multiple fields, including Archaeology, Anthropology, and Africology. Topics included early African innovations, transfer of African indigenous knowledge to European thinkers, and modern African American STEM achievements. Mr. West began the lecture by emphasizing the importance of scientific literacy. Next, students learned about ancient sites demonstrating African ingenuity, such as Pinnacle Point, where as early as 164,000 years ago, coastal foragers exploited marine resources and developed knowledge of tidal and lunar cycles that facilitated shellfish harvesting (Marean, 2012). This illustrates indigenous astronomical knowledge developed and applied by early Africans. The lecture also highlighted Africans' controlled use of fire as a technological milestone, emphasizing how fire manipulation enabled material hardening for tool-making and reflected early applications of engineering (Brown et al., 2009). Furthermore, the lecture presented Nabta Playa, an early observatory used to track celestial events more than 7,000 years ago, further illustrating the scientific thinking and indigenous astronomical knowledge embedded within early African knowledge systems (Malville, 2020). The lecture concluded early African innovation with a discussion on bow and arrow. Bow-and-arrow technology emerged in Africa around 71,000 years ago and constituted a major technological innovation requiring advanced planning, engineering design, and materials knowledge (Henshilwood, 2012). Mr. West contended that the bow and arrow may have established early principles of projectile technology that later informed the evolution of ranged weapons, including bullets.

The lecture then shifted to discussing the transfer of African indigenous knowledge to European thinkers during the Scientific Revolution. Links were established between Charles Darwin and John Edmonstone, who taught Darwin the skill of taxidermy, which later informed his ideas about evolution (McNish, 2020). Additionally, connections were drawn between Darwin and Al-Jahiz. In *Kitab al-Hayawan* (*Book of Animals*), Al-Jahiz documented animal behavior to illustrate environmental influences on species, advancing ideas resembling natural selection long before Darwin (Stott, 2012). The lecture next traced the development of vaccines to inoculation practices long used in Africa, highlighting Onesimus, an enslaved African man who introduced variolation to the American colonies, reflecting early immunological understanding and laying the groundwork for modern vaccination (Kabi, 2024).

The last part of the lecture showcased modern African American achievements in science. It highlighted Dr. Patricia Bath, the first African American woman to receive a medical patent, invented the Laserphaco Probe, revolutionizing cataract surgery by improving surgical precision (Bath, 2020). Students learned about Percy Julian, a pioneering African American chemist whose synthesis of plant-derived medicinal compounds enabled the first commercial production of cortisone and the development of widely used anti-inflammatory medications (Science History Institute, n.d.). The lecture concluded with Elijah McCoy, who invented the automatic lubricator– a major breakthrough in machinery lubrication that improved equipment reliability and lifespan (National Inventors Hall of Fame, n.d.).

The lecture underwent one iteration of updates during this study. In the initial version, the sequence of topics did not adhere to a chronological framework, and the presentation style was less engaging. In the revised version, Mr. West refined and reorganized the content into a clear historical sequence. He also added additional content, including Blombos Cave and Still Bay which were sites that demonstrated early African innovation. These sites were previously referenced only through images without dedicated explanatory slides. Additionally, Dr. Kizzmekia Corbett, an African American immunologist, was referenced, while two African American high school students, Calcea Johnson and Ne'Kiya Jackson, were highlighted for developing new trigonometric proofs of a theorem previously considered unprovable; in contrast, Elijah McCoy and John Edmonstone were removed from the lecture content.

Conceptual Framework: The African-Centered STEM Education Model

This qualitative case study employs the African-Centered STEM Education (ACSE) model, developed by Dr. DeAnna Bailey, as an interpretive framework. The ACSE model is a framework that integrates African-centered pedagogy into STEM educational contexts. As articulated by Bailey, Bowens, and Altman (2024), the model is designed to support African-descended students' interest, engagement, learning, and identity development in STEM, while encouraging reconceptualization of how students interpret and practice STEM and affirming their cultural identity. While grounded in African-Centered Education (ACE)—defined as "a restorative and preparatory educational process created to foster cultural and historical awareness and equip individuals with the critical consciousness, knowledge, skills, values, and morals needed to empower the African diaspora" (Bailey, Bowens, and Altman, 2024, p. 3)—the ACSE model extends this foundation into STEM-specific contexts. Drawing on Akoto's (1992) ACE framework, the ACSE model similarly emphasizes cultural centering, identity restoration, nation building, holistic development, liberation, and the perpetuation of African values as lenses through which students interpret and apply STEM.

The key features of the African-Centered STEM Education (ACSE) model, as articulated by Bailey, Rotindo and Ojuok (2025), include Ethnically matched instructors, African-centered teaching strategies, Inclusive STEM curriculum, Reconceptualization of STEM and its utility, and Incorporation of African culture. In this study, two features—African-centered teaching strategies and Reconceptualization of STEM and its utility—were updated for distinct purposes. African-centered teaching strategies were clarified to emphasize that they involve not only how content is taught, but also the intentional selection and use of content. Reconceptualization of STEM and its utility was renamed Reconceptualization of STEM, and its description was refined to explicitly encompass how students interpret the STEM field itself and their place within it. The phrase “its utility” was removed because considerations of purpose, application, and function are inherently embedded in how STEM is interpreted and positioned as a field.

Table 1

African-Centered STEM Education Model Key Features

Component	**Description**	**Implications**
Ethnically-matched instructors	Instructional leaders whose cultural identity aligns with those of their students and who draws on shared cultural knowledge to support learning and identity development in STEM.	Supports students’ STEM learning and identity development through culturally affirming instructional leadership.
African-centred teaching strategies	Instructional approaches that align with African ways of learning and knowing—encompassing epistemologies, cognitive frameworks, and culturally grounded instructional practices—and involve the intentional selection and use of content.	Supports African-descended students’ learning, comprehension, and retention of STEM concepts while affirming culturally grounded ways of learning and knowing.
Inclusive STEM Curriculum	A STEM curriculum that presents a comprehensive view of the field by recognizing STEM as a global and historically collective human endeavor and highlighting the achievements of diverse cultures.	Broadens students’ understanding of STEM as a historically and globally constructed field, expands what is recognized as legitimate STEM knowledge and contributors, and supports students’ sense of belonging within STEM.
Reconceptualization of STEM and its utility	Reframing how the STEM field is interpreted as a whole, redefining what counts as STEM knowledge and who is recognized as a contributor, and expanding the ways STEM is applied.	Transforms how students understand STEM as a field, reshapes assumptions about what constitutes legitimate STEM knowledge and who can be a knowledge producer, and expands how students imagine the purposes and applications of STEM.

Incorporation of African culture	Establishing a learning environment that intentionally integrates and upholds African values, principles, and practices.	Establishes a culturally affirming learning environment that strengthens students' connection to their cultural heritage and influences how they interpret and practice STEM.

Collectively, these features aim to create STEM learning environments that support African-descended students' interest, learning, engagement, self-efficacy in STEM, as well as their STEM and cultural identity development. Prior research demonstrates that implementation of the African-Centered STEM Education (ACSE) model—either fully or partially—is associated with increased interest, confidence, self-efficacy, and STEM knowledge among African-descended students (Bailey, Bowens & Knox, 2025; Bailey, Ojuok, & Altman, 2024; Bailey, Rotindo, & Ojuok, 2025).

This qualitative case study utilizes the African-Centered STEM Education (ACSE) model as an interpretive framework to examine the effects of integrating Continental and Diasporic African STEM achievements into an Historically Black College and University (HBCU) engineering curriculum on African-descended students' views and interpretations of STEM, motivation, and engineering identity, with particular attention to engineering. The ACSE model also guided the interpretation of student responses regarding their understanding of the goals of this integration and their assessments of its value and influence within their engineering education.

Research Methods

This study employs a single-case exploratory qualitative case design to examine the impact of integrating Continental and Diasporic African STEM achievements into an HBCU engineering curriculum. The case in this study is defined as the integration of a culturally-centered STEAM lecture within core engineering courses at Morgan State University and its influence on African-descended students' views and interpretations of STEM, motivation, and engineering identity. It also explores how students made sense of the goals of this integration and assessed its value within their engineering education. The unit of analysis is students' written reflections following exposure to the lecture. The research was guided by three questions: How well do African-descended students demonstrate an understanding of the goals of their exposure to Continental and Diasporic African STEM achievements? How does exposure to this content influence African-descended students' views and interpretations of STEM, motivation, and engineering identity? How do African-descended students evaluate the relevance and effectiveness of lectures centered on Continental and Diasporic African STEM achievements within engineering education? To address the research questions, the study employed a systematic and critical qualitative approach centered on the collection and analysis of written student reflection papers, which served as the primary data source.

Approach

Students participated in a forty-five-minute lecture that highlighted Continental and Diasporic African achievements in STEAM. Following the lecture, students were asked to write a one-page reflection paper responding to the following writing prompts: What do you believe was the objective of the lecture? Describe a key point or insight from the lecture that stood out to you and why. How did learning about these contributions impact you? Would you recommend this lecture to other students? Why or why not? All written reflection papers were de-identified and labeled using numerical identifiers (e.g., Student [number]). The papers were distributed evenly amongst the research team and underwent multiple rounds of coding. The coded responses were interpreted through the African-Centered STEM Education (ACSE) model to identify emergent themes.

Participants

This study was conducted over the course of one year, spanning three academic terms, from Fall of 2024 through Fall 2025. During each term, all participants in this study were exposed to a lecture by Mr. Robert West, a science advocate and communicator, who highlighted Continental and Diasporic African achievements in STEAM. Participants were Electrical and Computer Engineering students at Morgan State University. Morgan State University was selected as the study site because, as an HBCU, it provides a meaningful context for examining how culturally centered pedagogical approaches may influence African-descended students' identity development and educational outcomes in engineering. The participants were enrolled in the following core engineering courses: Introduction to Electrical Engineering, Electric Circuits, and Signals and Systems. Introduction to Electrical Engineering is typically completed by first-year students, while Electric Circuits and Signals and Systems are primarily completed by sophomore-level students. All courses were taught by the same professor. The lecture was integrated into regular course instruction and consistently delivered with minor changes.

Data Collection and Analysis

Following the lecture, students had one week to submit a one-page reflection paper through Canvas, the institution's learning management system. Student reflection papers served as the sole data source. Of the 101 reflection papers collected, analysis focused on papers written by African-descended students, totaling 93. All students experienced the same lecture and responded to the same structured prompts, providing consistency in data collection. A deductive coding approach was applied, using predefined primary codes and child codes generated from the writing prompts. These codes were used to identify thematic patterns in the data. The codes utilized in the analysis are described below:

1. **Lecture Objective**– Captures the extent to which students understand the goals of the lecture.

    ○ *Strong*: Student identifies three of the four lecture goals, which included increasing student awareness of Continental and Diasporic African STEM achievements, challenging dominant narratives about STEM, fostering a connection between the student's cultural identity and STEM, motivating a pursuit of and building confidence in STEM by showcasing the STEM achievements of their ancestors.

    ○ *Moderate*: Student identifies at least two lecture goals.

    ○ *Weak*: Student provides at least one lecture goal.

    ○ *No Understanding*: The student does not state any lecture goals or misinterprets the purpose of the lecture.

2. **Key Insight** – Identifies the aspects of the lecture content that stands out most to students and the reasons for their significance.

    ○ *African History*: Students cite early African innovations, historical African civilizations and/or figures.

    ○ *European History*: Students cite European historical figures.

    ○ *Underrepresentation*: Students point out the limited participation of African Americans or other marginalized groups in STEM.

    ○ *Human Biases*: Students recall or discuss bias rooted in scientific illiteracy, culture, or ignorance.

    ○ *Quotes*: Students recall, paraphrase, or directly quote statements made by the lecturer.

3. **Student Impact**– Describes the type of effect the lecture content has on students.

- ○ *Emotional*: Students express emotional responses to the lecture (e.g., pride, inspiration, motivation, confidence, appreciation)
- ○ *Awareness*: Students convey increased awareness of Continental and Diasporic African STEM achievements and/or the importance of recognizing these contributions.
- ○ *Cultural*: Students express a sense of cultural connection or ownership, identifying STEM as part of their heritage or legacy.
- ○ *Engineering Identity*: Students state excelling in engineering, a sense of connection to the field, and validation.
- ○ *No Impact*: Student indicates no meaningful impact from the lecture.

4. **Recommendation** – Indicates whether students would recommend the lecture to others.
   - ○ *Yes*: Students would recommend the lecture because it was impactful, meaningful, and relevant to their understanding, motivation, or perspective on STEM.
   - ○ *No*: Students would not recommend the lecture because it was unnecessary, uninformative, or unclear.

The analysis followed a systematic process from student reflections to codes, themes, and final interpretations tied to the research questions. Each reflection was iteratively coded to ensure that (1) the codes captured data relevant to the research questions, (2) the codes were accurately applied, and (3) the codes were consistently applied across team members. The African-Centered STEM Education (ACSE) model guided interpretation of the coded excerpts and the identification of themes related to shifts in students' views and interpretations of STEM, engineering identity, and motivation. This process helped ensure that findings were grounded in the data and clearly linked to the study's framework.

Research Results

Analysis of the reflection papers revealed variation in students' understanding of the lecture objectives. Dominant themes reflected in students' responses included increasing awareness of Continental and Diasporic African STEM achievements, challenging dominant narratives in STEM, and inspiring and motivating students' pursuit of an engineering degree and career. Students demonstrating a moderate understanding of the lecture objectives provided responses reflecting multiple themes, whereas those with a more limited understanding tended to emphasize increased awareness as the primary aim of the lecture.

Increasing Awareness of Continental and Diasporic African STEM Achievements

The most prevalent theme related to students' understanding of the lecture's objective was increasing awareness of Continental and Diasporic African achievements. Most students described the lecture's purpose as highlighting overlooked Continental and Diasporic African innovation, as reflected in Student 12's statements: "Mr. Bobby West's presentation on African contributions to STEAM emphasized these contributions to show how Africa has also played a role in various inventions that are often overlooked. His intention was to educate students about these contributions and recognize African innovators throughout history." This interpretation is further supported by the finding that more than half of students identified historical African innovation as the most important takeaway from the lecture. Alongside historical African innovation, African American innovation was recognized as a key insight, indicating that students not only recognized early foundational contributions but also made connections to more contemporary innovators. These findings suggest an expanded awareness of African peoples' contributions to the development of the STEM field.

Challenging Dominant Narratives in STEM

The second most prominent theme in students' understanding of the lecture's aims was the challenge to dominant conceptions of who has contributed to the production and practice of STEM. For example, Student 21 stated, "Mr. Bobby West's lecture sought to highlight Africa's significant contributions to science, technology, engineering, and mathematics (STEAM). He emphasized how many fundamental scientific advances came from African civilizations, which are frequently overlooked in mainstream history. The lecture challenged the common Eurocentric viewpoint and encouraged students to acknowledge Africa's significance in shaping global scientific and technological progress." This response demonstrates that students identified the lecture as addressing misconceptions and presenting STEM as a globally and historically rooted field, with particular emphasis on Africa's central role in its development.

Inspiring and Motivating Students in Engineering

Another theme related to students' understanding of the lecture's goal was its role in inspiring and motivating their pursuit of engineering degrees and careers. This perspective is illustrated by Student 10, who stated, "The biggest takeaway from his lecture was his message to keep pushing forward in our engineering journey. He was encouraging us to stay true to who we are, be proud of what we're becoming, and recognize the foundation we're building on, and learn from those who came before us." This response indicates that the student interpreted the lecture as intentionally designed to encourage persistence in engineering while fostering a sense of pride and continuity with prior generations, positioning their academic journey as part of a broader legacy of innovation and achievement.

Analysis of student reflections also revealed that participants consistently described being impacted by the lecture in a variety of ways. Their responses pointed to several interconnected themes rather than isolated outcomes. Dominant themes included expanded awareness of Continental and Diasporic African STEM history, emotional affirmation and motivation, strengthened engineering identity, and cultural reconnection and pride. These themes often overlapped within individual reflections, indicating that students made sense of the lecture cognitively, emotionally, culturally, and professionally at the same time.

Expanded Awareness of Continental and Diasporic STEM History

A dominant theme involved students describing how the lecture introduced knowledge they had not previously encountered and prompted them to reconsider how African American history had been presented in earlier schooling. For example, Student 11 wrote, "Learning about these contributions amazed me with information that I didn't know. I realized that this rich history was never discussed in elementary school, middle school, and even high school before. We just talked about slavery and civil rights… but we never really praised or shined a light on the creations created by people of color that were done in the past and are used today." Through this reflection, the student positions the lecture as corrective, expanding their understanding of African American history while highlighting prior educational omission.

Emotional Affirmation and Motivation

Another dominant theme centered on students describing feelings of inspiration, empowerment, pride, and renewed motivation after learning about Continental and Diasporic African STEM achievements. These emotional responses were often connected to seeing people who shared their heritage represented as contributors to scientific and technological advancement. For example, Student 68 reflected, "Many of these incredibly influential inventions changed my beliefs about the impact of my people… Mr. Bobby West's lecture on African contributions to STEM revealed to me how much of our scientific history is not given attention to. By sharing these inventors with us, Mr. West successfully inspires us to try harder with our studies in engineering." This response suggests that inclusion of Continental and Diasporic African STEM achievements generated both pride and academic motivation.

Strengthened Engineering Identity and Sense of Belonging

Students also connected the lecture to increased confidence in their ability to succeed in engineering and a stronger sense that they belonged within the field. For example, Student 2 stated, "He allowed me to realize that greatness is attached to excelling at STEAM. African Americans from two centuries ago are still being mentioned today... I was left with a sense of pride and purpose... Now I know I have what it takes to obtain an Electrical Engineering degree." This reflection indicates that learning about Continental and Diasporic African excellence in STEM reinforced the student's confidence and positioned engineering success as attainable and personally relevant.

Cultural Reconnection and Ancestral Pride

A final dominant theme reflected students' descriptions of cultural reconnection and ancestral pride. Many students shared that they felt more connected to their roots and developed a deeper appreciation for African intellectual legacies. For example, Student 50 explained, "Learning about these African contributions made me feel a stronger connection to my roots. Even though I wasn't born in Africa, I now feel a greater sense of pride in the intellectual and innovative legacy of my ancestors. It's empowering to know that African thinkers weren't just resisting oppression they were shaping the world with their ideas." This response illustrates how students interpreted the lecture as linking STEM achievement to ancestry, culture, and identity.

Nearly all students indicated that they would recommend the lecture on Continental and Diasporic African STEM achievements to other students. Their reasons for recommending the lecture reflected an acknowledgment of the lecture's value, relevance, and impact on their understanding of STEM and its historical context. Patterns in the data highlighted three recurring themes: reframing STEM narratives, support for engineering identity and engagement, and cultural affirmation.

Reframing STEM Narratives

Students recommended the lecture because it challenged dominant, incomplete narratives about who has contributed to the production and practice of STEM. Through inclusive historical scientific and technical content, students described gaining a broader and more accurate understanding of African technological innovation and intellectual traditions. As Student 5 explained, the lecture "is not just a dry recount of facts; it is a rich narrative that gives credit to the achievements of African civilizations, challenging the typical historical timeline many of us are taught." They further emphasized that by "highlighting Africa's crucial role in shaping science and education, it opens up a broader understanding of our shared human story," reinforcing how the lecture reshaped their perception of STEM history. This reflection illustrates the reasoning behind students' recommendations, highlighting how the lecture contributed to a reconceptualization of STEM as a globally constructed and historically interconnected field.

Supporting Engineering Identity and Engagement

Students further recommended the lecture for its role in strengthening their engineering identity and engagement. Student 18, for example, highlighted how learning about ancestral achievements could directly influence persistence, explaining that exposure to "the achievements and milestones that were accomplished by their ancestors… would make them work much harder to get through the engineering program and become top tier Black engineers in their own right." This reflection demonstrates how representation within STEM history can reinforce students' confidence in their abilities and future potential. Additionally, Student 4 emphasized the lecture's capacity to inspire and encourage engagement, noting that it "might inspire people and make them feel more connected to the STEM community." These responses indicate that the lecture contributed to students' sense of belonging and professional identity within engineering.

Cultural Affirmation

Students also recommended the lecture for its role in affirming students' cultural identities. For example, Student 37 explained, "I would wholeheartedly recommend this lecture to every student, regardless of their major or background. For students of color, it is an essential and empowering narrative that affirms their place in the history of innovation and can serve as a powerful motivator in their own STEAM pursuits. For all students, it is a critical lesson in historical accuracy and intellectual humility." This reflection highlights how cultural affirmation operates through representation, fostering a stronger sense of identity, belonging, and connection within STEM.

Discussion

This exploratory qualitative case study examines how incorporating Continental and Diasporic African achievements into an HBCU engineering curriculum influences African-descended students' interpretations of STEM and shapes their motivation and engineering identity. The African-Centered STEM Education (ACSE) model was utilized as an interpretive framework to address the following research questions: How well do African-descended students demonstrate an understanding of the goals of their exposure to Continental and Diasporic African achievements? How does exposure to this content influence students' interpretations of STEM, motivation, and engineering identity? How do

African-descended students evaluate the relevance and effectiveness of lectures centered on these achievements within engineering education?

The findings indicate that many African-descended students demonstrated a moderate understanding of the lecture's aims. Students frequently interpreted the lecture as intending to increase awareness of Continental and Diasporic African STEM achievements, challenge dominant narratives about who has contributed to the production and practice of STEM, and inspire and motivate the pursuit of engineering degrees and careers. However, increased awareness was most commonly emphasized as the primary objective. Evidence of these aims is reflected in the lecture's impact on students, with these impacts often overlapping. The lecture expanded students' understanding of who has historically and contemporarily contributed to the growth and development of STEM, while also prompting reconsideration of dominant narratives. In addition to shaping students' interpretations of STEM, this exposure supported engineering identity development and motivated their pursuit of engineering degrees. Students described increased confidence, a stronger sense of belonging, and a clearer perception of themselves as future contributors to the field. The lecture also elicited emotional responses such as pride and inspiration, while strengthening students' cultural identities. The findings further indicate that African-descended students value the integration of Continental and Diasporic African achievements in engineering education, as nearly all students indicated they would recommend the lecture. Students routinely expressed that they would recommend the lecture because it reframed dominant STEM narratives, supported their engagement and identity within engineering, and affirmed their cultural identities. Collectively, these findings suggest that integrating Continental and Diasporic African STEM achievements not only broadens students' understanding of STEM, but also supports their motivation, identity development, and sense of belonging within the field.

Implications

This study's findings emphasize the need to incorporate the knowledge and achievements of cultures beyond Europe into engineering curricula. When engineering is framed through a narrow historical lens, students receive an incomplete view of the field and may struggle to see themselves as legitimate contributors. Integrating culturally diverse knowledge helps neutralize engineering, expand students' understanding of STEM as a collective human endeavor, and strengthen identity–STEM alignment. The African-Centered STEM Education (ACSE) model provides one example of how this approach can be implemented for African-descended students, as it centers African knowledge systems and reframes how students interpret STEM and their place within it.

Actionable steps can be taken at multiple levels. Educators can intentionally integrate historical and contemporary achievements from diverse cultures into lectures, problem sets, and design projects and explicitly connect these contributions to core engineering concepts. Institutions can support this work by providing faculty development and encouraging curriculum reviews that assess cultural representation as part of quality teaching. Policymakers and accreditation bodies can reinforce these efforts by recognizing culturally inclusive curriculum design as essential to equity and excellence in engineering education. Collectively, these actions offer concrete pathways for creating more inclusive engineering learning environments.

Future Work

In this study, student reflection papers served as the primary data source. To strengthen the findings, future research will incorporate additional data sources, including student surveys and interviews. Future work will also expand the study by increasing the sample size and including African-descended students from additional HBCUs to enhance the reliability of the findings. Additionally, we plan to develop a presentation focused exclusively on Continental and Diasporic African engineering achievements, as prior lectures incorporated multiple STEM disciplines beyond engineering. Future research will also examine approaches for integrating Continental and Diasporic African engineering knowledge and applications throughout engineering curricula by systematically mapping course concepts to relevant historical and contemporary examples. Finally, future work will incorporate additional African cultural elements, such as proverbs, into HBCU curricula and evaluate their impact on student learning, engagement, and identity development.

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