BRIDGING THE DIGITAL DIVIDE AT HISTORICALLY BLACK COLLEGES AND UNIVERSITIES THROUGH THE IMPLEMENTATION OF ARTIFICIAL-INTELLIGENCE-ENHANCED OPEN EDUCATIONAL RESOURCES

by

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Bridging the digital divide at historically black colleges and universities through the implementation of artificial intelligence-enhanced open educational resources

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Abstract

Schweitzer (2024) suggests that the digital divide is a term that describes the uneven distribution of information and communication technologies (ICTs) in society. The digital divide encompasses differences in access to and usage of computers and the internet among countries, socio-economic groups, and even political groups (Schweitzer, 2024). Schweitzer (2024) also mentions that the digital divide gained popularity in the mid-1990s when the National Telecommunications and Information Administration (NTIA) released a research report on internet diffusion among Americans. The report exposed widespread inequalities in national ICT access for ethnic minority groups and less-affluent people with low educational attainments (Schweitzer, 2024). Gibson (2021) describes the digital divide as a lack of access to the technology needed today. To benefit from technology, one must first have access to it, as technology continues to propel the world into the future; therefore, there should be an obligation to ensure everyone can keep up (Gibson, 2021). Research suggests that to address the issues created by the digital divide, those most affected —the disenfranchised learners —must be exposed to the latest technological concepts through educational opportunities in the higher education space (Samayoa et al., 2016). As defined by White (2006), HBCUs are accredited two-year, four-year, graduate, and professional institutions founded before the Civil Rights Act of 1964 to educate African Americans. White (2006) states that closing the digital divide is a national challenge among HBCUs. The inequalities created by the digital divide could undermine the efforts of HBCUs in educating an African American workforce capable of fully participating in a global information economy (p. 13). However, this paper aims to explore the effect of incorporating Artificial Intelligence (AI) enhanced technology into the infrastructure and curriculum of HBCUs to strategically address the technology gap influenced by the ongoing digital divide. The pursuit of modernizing the technology infrastructure of HBCUs using AI paves the way for colleges and universities to adopt a "smart" university model, strategically moving the institution into the next generation.

Keywords: Open Educational Resources, Artificial Intelligence, higher education, digital divide, Historically Black Colleges and Universities

Introduction

Research findings demonstrated that the inadequate utilization of Open Educational Resources (OER) within Historically Black Colleges and Universities (HBCUs) resulted from inequities that stemmed from the longstanding presence of the digital gap, which persistently afflicted higher education institutions with deep-rooted disparities over an extended period, as indicated by (Samayoa et al., 2016). Scholars expressed a valid concern that, should HBCUs not have addressed the imbalances brought about by the digital divide and overlooked the integration of innovative technological principles, such as AI-enhanced OER materials, the gulf created by the digital gap would only have continued to expand, with no foreseeable resolution in the future, according to (White, 2006). George and Wooden (2023) argued that transforming an institution into an AI-centric entity could significantly enhance its competitive edge. They believed this transformation could have been crucial in bridging the educational inequalities often faced by HBCUs. On the other hand, Laufer et al. (2021) addressed several inequalities associated with implementing digital education at the individual, institutional, and system levels, suggesting that addressing these issues would help close the technology gaps caused by the digital divide. Ossiannilsson et al. (2024) expressed concerns that AI could potentially exacerbate the digital divide among socio-economic and geographic groups, proposing a solution by promoting initiatives that enhance AI literacy skills among students and teachers.

This qualitative research examined the critical role of AI-enhanced OER in reducing educational inequities at HBCUs. The study explored the multifaceted barriers that contributed to the digital divide, such as limited access to technology and institutional resources, and how AI-integrated OER enhanced learning experiences, improved accessibility, and addressed specific pedagogical needs.

Additionally, this investigation probed the institutional challenges that HBCUs faced in adopting and implementing these technologies, offering a comprehensive understanding of how AI-driven OER could have transformed educational outcomes and contributed to more significant digital equity in higher education. Therefore, it was imperative to explore through research the benefits of enhancing the HBCU educational experience using AI-enhanced OER resources. The primary focus of the research study was to establish technological equity across all digital platforms for every college or university because the digital divide persisted.

This study examined the multifaceted barriers that contribute to the digital divide at HBCUs, focusing on access to technology and institutional resources. Additionally, it examined how AI-enhanced OERs enhanced the learning experience and accessibility for students at HBCUs. The study also explored the specific instructional needs of HBCU students and discussed how AI-driven OER effectively addressed these needs. Furthermore, it analyzed the institutional challenges that HBCUs faced in adopting and implementing AI technologies and OER within their educational frameworks. Lastly, the study aimed to assess the potential impact of AI-enhanced OER on academic outcomes and digital equity in higher education at HBCUs.

The research structure depicted several vital sections and provided a comprehensive preliminary review of the relevant literature. This review outlined the current state of knowledge and identified any gaps this research aimed to address. Following this, the study detailed the methodology, including an in-depth description of the research procedures and the techniques used for data analysis. This structured approach ensured clarity and coherence throughout the research.

The research aimed to address the following research questions employing a qualitative study:

RQ1: Did AI integration with OERs bridge the digital divide and enhance HBCU campuses, their mission, and their students?

RQ2: What advantageous effects did AI have on the pedagogical approach of HBCU instructors?

RQ3: What challenges or limitations existed when considering implementing AI-enhanced OER resources?

Literature Review

According to Laufer et al. (2021), the COVID-19 pandemic heightened the need for higher education institutions to review their existing digital education platforms, if any existed, or to establish one for the future. The authors addressed several inequalities associated with implementing digital education at the individual, institutional, and system levels, suggesting that addressing these issues would help close the technology gaps caused by the digital divide. Laufer et al. (2021) also provided an interesting definition of the new digital divide. The original definition differed from the new one in that it focused more on the social inequalities of individual access to the basics of digital learning. In contrast, the new definition centered on digital literacy and competency.

Addressing the Digital Divide and Embracing Innovation

Before the onset of the COVID-19 pandemic, the digital divide was already present, and HBCUs were already experiencing its effects. White (2006) explained that the digital divide challenged the IT infrastructure of HBCUs, particularly in the Commonwealth of Virginia, and highlighted three common digital gaps affecting HBCUs—student access, bandwidth, and faculty utilization issues. In the author's opinion, to move HBCUs towards digital equality, the institution's attention and focus should have been

centered around increased funding, faculty buy-in, and forward-thinking strategic decision-making that involved the institution's infrastructure (White, 2006). According to Wilson (2023), HBCUs have begun to secure more funding and garner increased outside support for technological initiatives within their institutions. Wilson (2023) further explained the technological initiatives that HBCUs should have used with funding, such as robotic process automation, AI chatbots, and a more robust technological infrastructure.

Incorporating technological advancements could have helped HBCUs overcome several barriers to implementing technology successfully and dispelled the researcher's concern with the recent success of funding being temporary and potentially detrimental to the outlook of HBCUs (Wilson, 2023).

Transforming HBCUs through Artificial Intelligence (AI)

Ossiannilsson et al. (2024) noted that the significant rise of Artificial Intelligence (AI) resulted from the emergence of generative tools driven by natural language processing and neural network algorithms. The authors defined OERs as educational materials available in various formats and media, freely accessible for reuse, adaptation, and redistribution, either in the public domain or under open licenses. Additionally, the authors argued that integrating AI empowered educators and content creators to streamline the creation of high-quality OER, thereby saving time and effort. Their research, however, also identified several challenges that underscored the necessity for collaboration among educators, researchers, policymakers, and technologists.

They emphasized the importance of embracing principles such as openness, inclusivity, and quality to ensure that AI-enhanced OER positively impacts education. Ossiannilsson et al. (2024) also expressed concerns that AI may intensify the digital divide among socio-economic and geographic groups.

They proposed addressing this issue by promoting initiatives that enhanced AI literacy skills among students and teachers. George and Wooden (2023) conducted a study to explore the impact of adopting an AI framework, the Smart University model, for HBCUs to incorporate a more innovative educational learning environment emphasizing machine learning and natural language processing. The study revealed the benefits, challenges, and future potential of transforming the HBCU educational landscape using the proposed AI framework. George and Wooden (2023) argued that transforming an institution into an AI-centric entity could significantly enhance its competitive edge. They believed this transformation could have been crucial in bridging the educational inequalities often faced by HBCUs. By incorporating AI-driven technologies and initiatives, such as the Smart University model, institutions could have provided more equitable access to high-quality education and resources, typically less available to them than to more affluent institutions (George & Wooden, 2023).
Additionally, George and Wooden (2023) emphasized that an AI-centric approach could have enhanced the academic programs offered by HBCUs. By integrating AI and other advanced technologies into their curricula, HBCUs could equip their students with a skill set highly relevant to the ever-evolving job market, including technical skills related to AI and data science, critical thinking, problem-solving, and adaptability. These skills were increasingly in demand across various industries, and having them could have significantly enhanced the employability and career prospects of HBCU graduates (George & Wooden, 2023).

Advancing Education through Other Innovative Tools and Inclusivity

Although consensual research had identified and confirmed that the digital divide targeting HBCUs had existed for years and that the need for HBCUs to strategically improve their technology infrastructure with the implementation of innovative learning resources was becoming a necessity for institutional viability, there had also been a consensus of thought towards the approach and direction HBCUs should have taken. Samayoa et al. (2016) declared a strong stance on whether HBCUs should adopt the innovative tool of Massive Open Online Courses (MOOCs) so that their institutions could follow the latest technological trends. The authors' research supported their belief that HBCUs should adopt

MOOCs only after first evaluating their benefits. Samayoa et al. (2016) defined MOOCs as online course content, including lectures and quizzes, accessible online. In comparison, OER, a similar innovative tool, was educational materials such as textbooks and lecture notes that were free and accessible to everyone. The authors expressed concern about a lack of or the need for better data to support the push for implementing MOOCs before assessing their relevance to the institution's mission and its students, leading the authors to suggest in their research that HBCUs would have benefited significantly from working to bridge the digital divide that targeted their institutions rather than focusing on the advertised bells and whistles associated with MOOCs (Samayoa et al., 2016). According to Singh (2022), India, for instance, had the second-highest number of internet users globally, with further growth anticipated in the future.

India has chosen to supplement its learning environment within the higher education sector by adopting an innovative approach to address the need for better and faster learning. Singh (2022) believed that innovative learning involving eLearning solutions, AI, and Machine Learning (ML) provided holistic learning opportunities for students to adapt to the rapidly changing world of technological advancements, moving them closer to acquiring the skills needed for the digital future. Singh (2022) pointed out that India had experienced substantial growth in its educational sector by embracing several innovative learning initiatives and establishing a solid foundation in ICT.

Some researchers believed that inclusiveness was an essential factor to consider when addressing the impact of the digital divide on HBCUs. Hall (2019) expressed a compelling viewpoint on racial inequality's significant role in intensifying the digital divide, mainly affecting African Americans and HBCUs. Hall (2019) emphasized that the entrenched disparities rooted in race were not just a peripheral issue but a central factor that continued to widen the gap in access to digital technologies and resources. Hall (2019) claimed that culture and tradition have fundamentally shaped the development and adoption of technology.

The author argued that the representation of minority groups in the tech industry was inadequate when developing and implementing innovative technological solutions. Instead, there had to be a deep and meaningful inclusion of diverse perspectives that influenced the entire process, from conception to execution.

Opinions on AI and the Digital Divide

Researchers held diverse opinions on the implementation of AI-driven technologies within HBCUs. Laufer et al. (2021) highlighted that before HBCUs could fully assess the success or failure of any IT implementation, they had first to address the deep-rooted inequalities caused by the digital divide. Laufer et al. (2021) suggested that tackling these underlying issues was necessary for any technological advancements to achieve their full potential and succeed. Similarly, White (2006) argued that unless HBCUs successfully implemented innovative technological solutions, the digital divide would not only have persisted but also have widened, potentially leading to a situation where the divide became so extensive that it became increasingly difficult, if not impossible, to manage or mitigate. White (2006) emphasized that proactive and effective technology implementation was crucial to preventing this scenario.

Additionally, Wilson (2023) stressed the critical need for substantial investments and sustainable funding to support the technological advancement of HBCUs. He warned that without these financial resources, HBCUs would have continued to lag behind other institutions regarding technological capabilities.

Research Methodology

This research used a qualitative case study approach to explore the digital divide and the limited use of OERs at HBCUs. This methodology was well-suited for examining the complex and context-specific

challenges and opportunities in implementing AI-enhanced OER. This qualitative case study enabled the research focus to capture the cultural behaviors of HBCUs regarding adopting OER resources and their perceptions of AI integration. It also provides a framework for understanding how these emerging technologies could promote educational equity (Creswell & Poth, 2018). By focusing on a single institution, the study sought to generate meaningful insights into the experiences of key stakeholders while addressing broader implications for HBCUs.

The research focused on Trenholm State Community College, one of two HBCUs in Montgomery, Alabama. Trenholm State was a designated Historical Black Community College (HBCC) chosen because of its inception of OER adoption and the institution's interest in including AI-enhanced learning materials, particularly within its General Education and Computer Information System courses. The study involved stakeholders, such as administrators, faculty, IT staff, and students, who offered their unique perspectives on the challenges and opportunities associated with the adoption of OER resources and their understanding of how AI could potentially reduce the digital divide and what effect it would have on the institution. A select group of Trenholm State Community College administrators, faculty, IT Staff, and students in General Education and Computer Information Systems comprised the survey sample of approximately 100 participants. A targeted sample of participants was carefully selected to ensure a well-balanced and inclusive study, representing a diverse yet representative cross-section of students, faculty, and staff within Trenholm State Community College.

The researchers collected data from four online surveys created via MS Forms to gather and analyze the in-depth responses from selected stakeholders' submissions. Each survey had questions explicitly tailored for each stakeholder participant. A Trenholm State Community College General Education or Computer Information Systems faculty member randomly administered the survey to students in traditional in-person and online classes. At the same time, the researcher randomly selected the remaining stakeholders to participate based on their position or direct involvement in the college's OER adoption and integration process. Each participant received a consent form and the survey via a direct link or an assigned QR code sent to their Trenholm State email account.

The completion time for the survey was approximately 20 to 30 minutes, including the final step of online submission. This design allowed the researcher to explore key themes while reviewing the participants' varied experiences with OER and AI-enhanced resources.
The researchers manually compiled and analyzed the survey responses via Microsoft Excel to identify patterns and recurring themes that reflected the collective insights of the stakeholders. The researchers reported the common themes and patterns in a narrative format, sharing the participants' thoughts, opinions, and experiences while notating any significant impact within the stakeholder groups.

This analysis helped identify the challenges and opportunities for implementing OER and AI-enhanced materials at Trenholm State Community College. The findings provided practical recommendations for bridging the digital divide and enhancing access to educational resources through the engagement of Trenholm State's administrators, faculty, IT staff, and students, thereby developing a comprehensive understanding of the experiences, perceptions, and challenges associated with digital resources and technology adoption. Their insights were crucial in identifying effective strategies to integrate OER and AI-enhanced materials in ways that fostered educational equity. Ultimately, this study sought to offer actionable solutions that could support HBCUs in reducing the digital divide and advancing inclusive educational practices.

Results

Trenholm State Community College stakeholders provided seventy-five combined online survey responses, including administrators, faculty, IT staff members, and students. The survey aimed to gather comprehensive insights into the stakeholders' thoughts, experiences, and opinions regarding the institution's potential adoption of AI-enhanced OERs and to assess their impact on teaching, learning, and institutional effectiveness within an HBCU. These AI-enhanced resources improve access to high-quality educational materials and support innovative learning experiences.

The bar chart (Chart 1) depicts the demographic breakdown of Trenholm State College stakeholder survey responses by their respective departments. To ensure inclusivity, the researcher designed the survey to capture diverse perspectives, particularly regarding gender representation. The survey revealed that female participants accounted for 64% of the total responses, significantly outnumbering the male participants, who represented only 36% of the survey pool. This demographic distribution highlights the importance of considering gender-based experiences and challenges when evaluating the adoption of AI-enhanced OER within the institution.

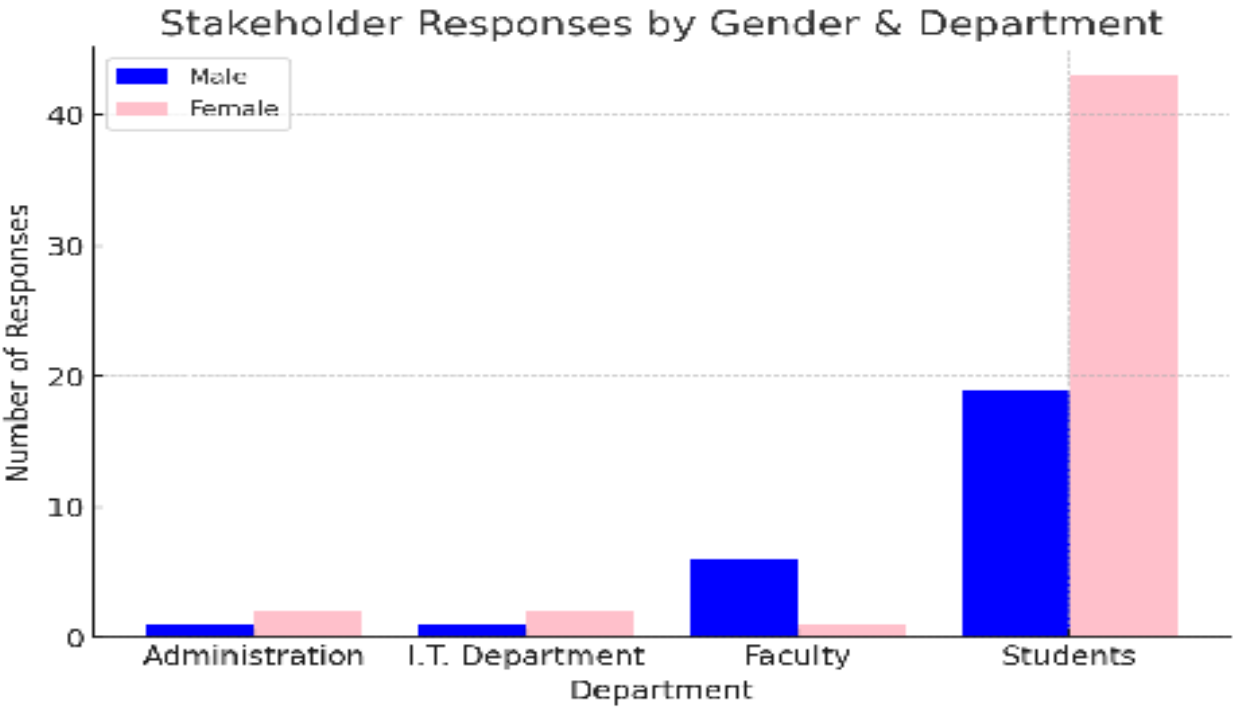

Chart 1: Stakeholder Demographic Information

The researchers designed the research questions to understand the implications of adopting AI-enhanced OER resources at Trenholm State Community College from the perspectives of its stakeholders: Administration, Faculty, IT staff, and students.

Regarding the central research question, RQ1, will AI integrate with OER bridge the digital divide and enhance HBCU campuses, their mission, and their students?

Findings from the stakeholder survey at Trenholm State Community College suggest that AI-enhanced OER has the potential to bridge the digital divide affecting HBCU campuses, their mission, and students. Trenholm State's mission focuses on providing comprehensive and accessible educational opportunities, including academic transfer and technical programs designed to promote economic and workforce development. Integrating AI-enhanced OER aligns with this mission by fostering an innovative, technology-driven learning environment that equips students with industry-relevant skills.

By adopting AI-enhanced OER, the college can modernize its curriculum, enhance student engagement, and improve learning outcomes, strengthening its competitive edge and ensuring students remain marketable in an evolving workforce. Additionally, AI-enhanced OER provides students access to high-quality, customizable learning materials, reducing financial barriers associated with traditional textbooks. Adopting AI-enhanced OER resources can lead to tremendous academic success, as students can access updated information, personalized learning experiences, and interactive study tools that support diverse learning styles. Furthermore, the increased digital literacy gained using AI-enhanced OER prepares students for careers in an increasingly technology-driven job market.

Beyond student benefits, adopting AI-enhanced OER strengthens the institution's ability to fulfill its mission by fostering inclusivity, improving resource accessibility, and encouraging innovative teaching practices. It enables HBCUs like Trenholm State to remain competitive in higher education by embracing advancements that support academic excellence and student achievement. Incorporating AI-enhanced OER catalyzes bridging the digital divide by ensuring that all students, regardless of background, have equal access to the tools and knowledge necessary for success in the modern workforce.

Concerning RQ2, what advantageous effects AI has on the pedagogical approach of HBCU instructors, results show that adopting AI-enhanced OERs provides numerous pedagogical advantages for Trenholm State Community College faculty, fundamentally transforming their instructional strategies. AI integration equips instructors with innovative tools that facilitate more dynamic, interactive, and personalized learning experiences. By leveraging AI-driven content, educators can tailor instructional materials to accommodate diverse learning styles, adapting to individual student needs through personalized learning pathways. This customization ensures that students receive targeted support, enhancing comprehension and retention.

Furthermore, AI-powered real-time feedback mechanisms enable instructors to continuously assess student performance, allowing for timely interventions and adjustments to teaching strategies. By utilizing AI-generated insights and predictive analytics, faculty can identify learning gaps more effectively, ensuring that struggling students receive the support they need before falling behind. This data-driven approach fosters a more responsive, student-centered learning environment, ultimately improving academic outcomes.

Additionally, AI-enhanced OER enables instructors to stay ahead of industry advancements by ensuring that course materials remain current and relevant. Automated content updates and AI-assisted research tools provide faculty access to the latest information, allowing them to align curricula with emerging trends in their respective fields. The updated curricula benefit student learning and strengthen the institution's ability to prepare graduates for the demands of the modern workforce.

Beyond content delivery, AI tools can support faculty in streamlining administrative tasks, such as grading assignments, managing course materials, and facilitating discussions through AI-driven chatbots or virtual teaching assistants. By reducing the burden of routine responsibilities, instructors can dedicate more time to meaningful student interactions, mentorship, and pedagogical innovation.

Integrating AI into HBCU classrooms ultimately enhances instructional efficiency, fosters deeper student engagement, and promotes more equitable learning experiences by addressing the individual needs of each student. As AI technology continues to evolve, its impact on the pedagogical strategies of HBCU instructors will likely expand, further bridging the digital divide and fostering academic success in historically underserved communities.

Concerning RQ3, the challenges or limitations when considering implementing AI-enhanced OER resources, the survey results highlighted several significant challenges and constraints of adopting AI-OERs at Trenholm State Community College. One primary concern is resistance to change between both faculty and students.

Many instructors may hesitate to incorporate AI-driven tools into their teaching due to unfamiliarity, skepticism about effectiveness, or concerns about job displacement. Similarly, students may feel apprehensive about engaging with AI-enhanced learning materials, mainly if they are accustomed to traditional instructional methods. Addressing these concerns requires a shift in mindset through targeted training, awareness programs, and gradual integration strategies.

Resource constraints pose another significant barrier to widespread implementation. A campus-wide adoption of AI-enhanced OER demands substantial financial investment in hardware, software, and

technical support services. Budget limitations may hinder the college's ability to acquire and maintain the necessary technology, restricting access to AI-powered learning tools for both faculty and students. Ongoing maintenance and updates require dedicated personnel and infrastructure, further straining institutional resources.

Another pressing challenge is the adequacy of the technological infrastructure to support AI-driven educational initiatives. Reliable internet access, high-performance computing capabilities, and cybersecurity measures must be in place to ensure seamless functionality. Without a robust digital ecosystem, AI-enhanced OER may not be accessible to all students, exacerbating existing digital divide issues. The faculty also expressed concerns about the reliability and accuracy of AI-generated content. The potential for misinformation or bias in AI-generated materials underscores the necessity for validation mechanisms, quality control processes, and human oversight. Instructors need clear guidelines and tools to verify AI-curated educational content before integrating it into their courses.
Trenholm State must implement a structured adoption model prioritizing faculty and student engagement to overcome these challenges. Institutions should establish comprehensive faculty training programs to build confidence in AI-enhanced teaching strategies, ensuring instructors can effectively leverage these tools to enhance learning outcomes. Likewise, student orientation programs can introduce learners to AI-enhanced resources, demonstrating their benefits and addressing concerns about usability.

Strategic investments in digital infrastructure, including upgraded network capabilities, AI-driven learning management systems, and dedicated IT support, are essential to sustaining AI-enhanced OER initiatives. Additionally, fostering a culture of adaptability through continuous professional development, institutional support, and cross-disciplinary collaboration will ensure a successful transition. By addressing these challenges proactively, the college can maximize the benefits of AI-enhanced OER while mitigating potential limitations, ultimately fostering a more inclusive, technology-driven learning environment.

Stakeholder-Specific Survey Insights on AI-Enhanced OER Adoption

Each stakeholder group received survey questions specifically tailored to their role within Trenholm State Community College. The researchers asked administrators to reflect on their involvement in institutional planning and decision-making regarding adopting AI-enhanced OER. Their responses offered valuable insights into the strategic considerations, policies, and potential challenges of implementing these digital resources. Additionally, the researcher asked administrators to identify any foreseeable obstacles that might hinder the adoption process, such as budget constraints, faculty readiness, or the need for additional professional development.

The researchers surveyed faculty members to understand their perceptions of using AI-enhanced OER to support student learning. Their responses helped assess faculty acceptance, enthusiasm, or concerns regarding integrating AI-driven educational tools into their courses. The feedback from faculty also sheds light on potential barriers, including the need for training, concerns about academic integrity, and the effectiveness of these digital resources in enhancing student engagement and comprehension.
The IT staff survey evaluated the institution's technological infrastructure and readiness to support AI-enhanced OER. The researchers asked IT staff members about their department's capacity to implement and maintain these digital tools and any anticipated technical challenges. Their insights were crucial in determining whether Trenholm State has the digital infrastructure, cybersecurity measures, and technical support systems to facilitate a seamless transition to AI-integrated learning environments.
The researchers surveyed Trenholm State’s students, the largest and most directly affected stakeholder group, to assess their familiarity with OER and document their experiences with courses that currently utilize these resources. Their feedback provided a clearer picture of student engagement, satisfaction, and challenges related to OER-based learning. Additionally, the survey sought to gauge student interest in AI-enhanced educational tools and determine whether these innovations could address existing gaps in learning materials' access, usability, and effectiveness.

The primary goal of the student survey was to secure broad support for a college-wide implementation of AI-enhanced OER resources. Gaining student buy-in is critical to ensuring the success of such an initiative, as their active participation and acceptance would directly influence the adoption and integration of these resources into academic programs.

Thematic Analysis of Qualitative Research

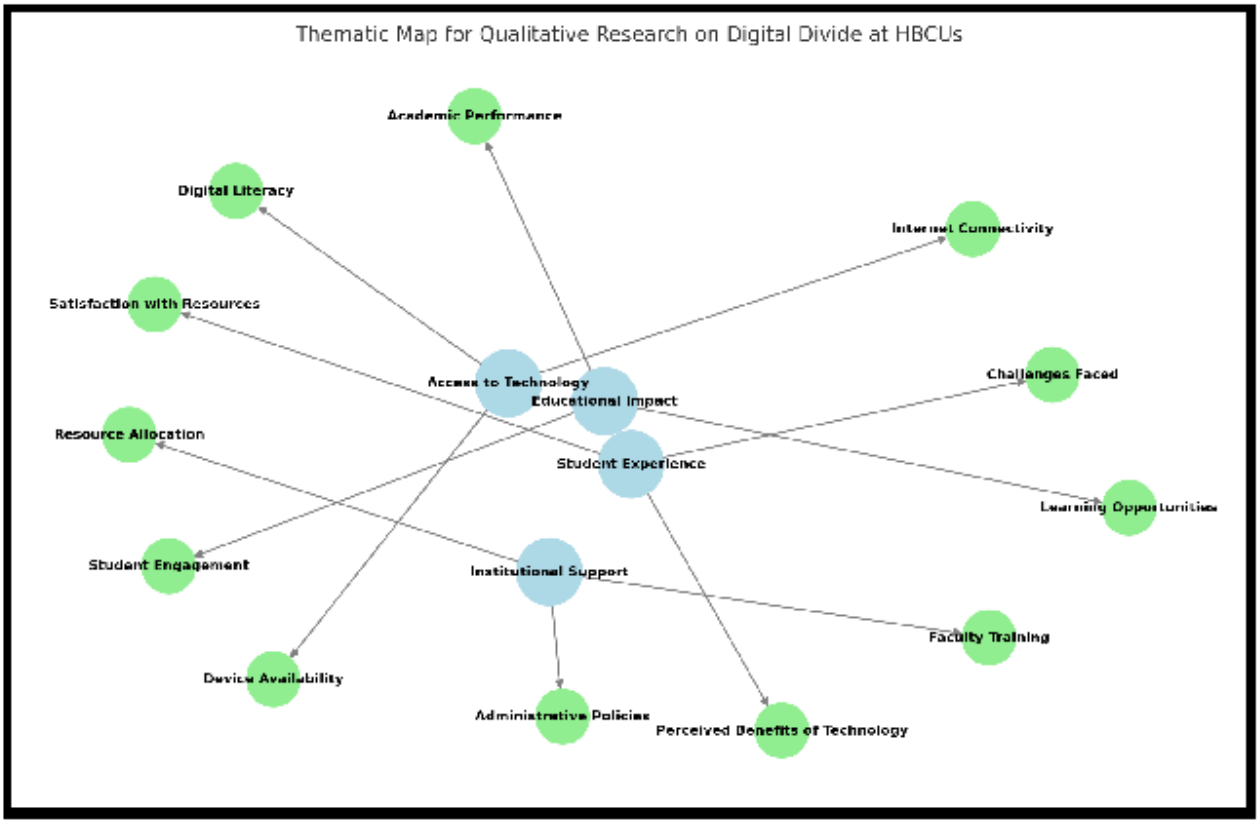

Figure1: Thematic Map for Qualitative Research on Digital Divide at HBCUs

Figure 1 – Thematic Map for Qualitative Research on the Digital Divide at HBCUs visually represents the four major analytical themes that emerge in examining the potential impact of adopting AI-enhanced OERs at HBCUs. These themes—Access to Technology, Educational Impact, Institutional Support, and Student Experiences—are interrelated, with each theme contributing to a broader understanding of how AI-driven educational resources can address disparities in digital access and learning opportunities at HBCUs. The thematic map also highlights the intricate relationships between the relevant codes associated with each theme, illustrating the connections and intersections that inform the research findings.

The Access to Technology theme is a foundational pillar in this study, as equitable access to digital tools, reliable internet connectivity, and AI-enhanced OER are essential for bridging the digital divide. Without adequate access, students may struggle to fully engage with AI-integrated learning platforms, limiting their ability to benefit from these innovations. This theme highlights the disparities in technological infrastructure and the availability of digital devices that can impact students' academic experiences.

AI-enhanced OER influences student engagement, academic performance, and resource accessibility, closely linking the themes of Educational Impact and Student Experiences to the Access to Technology theme. The Educational Impact theme examines how AI-powered educational tools, adaptive learning systems, and digital course materials contribute to learning outcomes, knowledge retention, and skill development. This theme also considers faculty perspectives on the effectiveness of AI-enhanced resources in fostering a more personalized and data-driven learning environment.

The Student Experiences theme delves into how learners interact with AI-driven OER, including their perceptions of usability, adaptability, and effectiveness. It highlights student engagement with digital platforms, their ability to navigate AI-generated content, and potential challenges such as digital literacy gaps or varying levels of technological proficiency. This theme also considers the socio-economic factors that may shape students' experiences, such as affordability, accessibility, and the level of institutional support they receive.

The fourth theme, Institutional Support, is crucial in determining the successful implementation of AI-enhanced OER at HBCUs. This theme encompasses policies, administrative initiatives, faculty training programs, and resource allocation strategies that institutions employ to integrate technology-driven learning solutions. It explores how leadership decisions, institutional priorities, and funding structures influence the adoption and sustainability of AI-powered educational tools. Additionally, this theme examines the role of faculty and staff in facilitating students' engagement with AI-enhanced OER, including professional development programs aimed at equipping educators with the skills necessary to navigate and optimize AI-driven learning environments.

These four themes—Access to Technology, Educational Impact, Student Experiences, and Institutional Support—provide a comprehensive framework for analyzing the digital divide at HBCUs in the context of AI-enhanced OER adoption. By understanding the intricate relationships between these themes, this research offers valuable insights into the challenges, opportunities, and strategic interventions necessary to bridge digital inequities and enhance student learning experiences at HBCUs.

Stakeholder Survey Findings

Results from the online survey revealed overwhelming approval from Trenholm State Community College's administrators, with 100% in favor of campus-wide AI-enhanced OER adoption efforts. The administrators cited several key factors contributing to their unanimous support, including significant cost savings, an improved learning environment, and enhanced student retention. Recognizing potential challenges in the adoption process, administrators expressed their commitment to full support and strategic implementation to ensure success. One primary challenge was securing faculty acceptance for the transition to AI-enhanced OER. However, administrators believed proper training and institutional backing could help mitigate resistance and facilitate a smooth integration process.

Like the administrators, 100% of faculty members surveyed agreed that adopting AI-enhanced OER would benefit both students and the institution. However, the faculty also expressed several concerns regarding its implementation. One of the most frequently mentioned concerns was the validity and reliability of online content used in AI-enhanced OER. A Computer Information Systems instructor highlighted this issue in his survey response: "I think that they (OER resources) can be useful, but I do caution the validity of the information distributed. The fact that it is open source is concerning because open source is not always as accurate as it needs to be for the college setting." This concern reflects a broader hesitancy among faculty about ensuring the credibility of AI-generated and OER content before integrating it into academic curricula.

Another significant concern among faculty was students' responsibility and engagement when using AI-enhanced OER. Some faculty members are concerned that students may become overly reliant on AI-driven resources, potentially hindering their critical thinking and independent learning skills.

A frequently suggested solution to address these concerns was the implementation of comprehensive user training programs for students before full-scale adoption. Faculty members emphasized the importance of guiding students to effectively utilize AI-enhanced OER while maintaining academic integrity and independent problem-solving skills.

Despite these concerns, both Trenholm State's administrators and faculty remained largely optimistic about AI-enhanced OER, viewing it as an excellent tool for research and an effective enhancement to

student learning experiences. They believed that AI-enhanced OER could significantly enrich the academic environment with the proper framework and institutional support.

The survey findings from the Information Technology (IT) staff at Trenholm State revealed a clear awareness of their department's critical role in ensuring the successful implementation of AI-enhanced OER. IT staff recognized that transitioning to AI-enhanced resources would increase demands on the college's current infrastructure, potentially causing performance issues if not adequately addressed. They emphasized the need for strategic planning, sufficient funding, and a phased implementation approach to prevent disruptions to the college's digital infrastructure. Additionally, the IT staff acknowledged that converting the entire institution into an AI-enhanced OER platform would be time-intensive and require broad institutional buy-in. They underscored the necessity of securing funding, faculty and staff participation, and extensive user training to facilitate a seamless transition.

The students presented a more divided perspective as the primary stakeholders in the proposed adoption of AI-enhanced OER. Only 39% of general education and computer information systems students who completed the survey reported familiarity with OER and its functionality when integrated with artificial intelligence. Those familiar with OER expressed a strong appreciation for its benefits, including ease of use, cost-effectiveness compared to traditional textbooks, and reduced dependency on physical materials. Many students who had prior exposure to OER in their courses praised its accessibility and convenience, noting that it helped streamline their learning process.

However, the challenges students cited revealed a varying reluctance to fully embrace AI-enhanced OER. Some students expressed concerns about the transition away from traditional textbooks, with a general education student stating, "I would prefer traditional textbooks because I can comfortably read and highlight the pages and do not have to be concerned about having an internet connection." Similarly, a computer information systems student shared, "Just getting used to the digital version rather than the actual textbook was challenging for me." These responses suggest that some students perceive the shift to digital resources as a significant adjustment that requires additional support and adaptation. Student opinions on AI-enhanced OER adoption remained divided, with some advocating for its implementation due to cost savings, access to current academic trends, and the mobility of digital resources.

Conversely, others raised concerns about whether AI-enhanced OER suits all academic programs. Some students believe OER should not be mandatory across all courses, arguing that specific disciplines might benefit more from traditional learning resources. Another concern highlighted by students was the accuracy of AI-generated content. They emphasized the importance of trusting the information provided by AI-driven OER and expressed a need for transparency in content verification. Additionally, students acknowledged the learning curve of transitioning to digital content, underscoring the importance of structured guidance and support to help them adapt.

In summary, while administrators, faculty, and IT staff at Trenholm State Community College largely support the adoption of AI-enhanced OER, each group identified specific challenges and considerations for successful implementation. Faculty concerns about content validity, student reliance on AI, IT staff's recognition of infrastructure demands, and students' divided opinions on digital resources all highlight the need for a carefully planned approach. Addressing these concerns through targeted training, infrastructure investments, and faculty-student engagement strategies will ensure the effective adoption and long-term success of AI-enhanced OER at Trenholm State Community College.

Discussion

The researcher's primary objective was to engage as many stakeholders as possible, particularly those with a vested interest in the research topic or those directly affected by the implementation of AI-enhanced OER. Understanding their perspectives was critical to assessing adopting these digital tools' feasibility and potential impact. By incorporating input from multiple stakeholder groups, the researcher aimed to ensure a well-rounded and inclusive analysis of the adoption process.

Ossiannilsson et al. (2024) emphasized the importance of embracing principles such as openness, inclusivity, and quality to ensure that AI-enhanced OER positively impacts education.
A significant proportion of the respondents consisted of Trenholm State students. The researchers specifically targeted this group, anticipating a high response rate due to the direct impact that AI-enhanced OER could have on their academic experience. Students are the primary beneficiaries of these resources, making their perspectives invaluable in determining the effectiveness and desirability of AI-integrated learning tools. On the other hand, responses from the remaining stakeholder groups, such as faculty, administrators, and IT staff, were comparatively lower. The smaller number of employees within these departments limits the pool of potential respondents, contributing to this lower participation rate. Chart 2 graphically depicts the student stakeholder participation by gender and their respective areas of study – general education and computer information systems. Female general education students accounted for a significant proportion of responses, compared to a smaller percentage of male respondents. In contrast, male computer information systems students outperformed female students in that discipline.

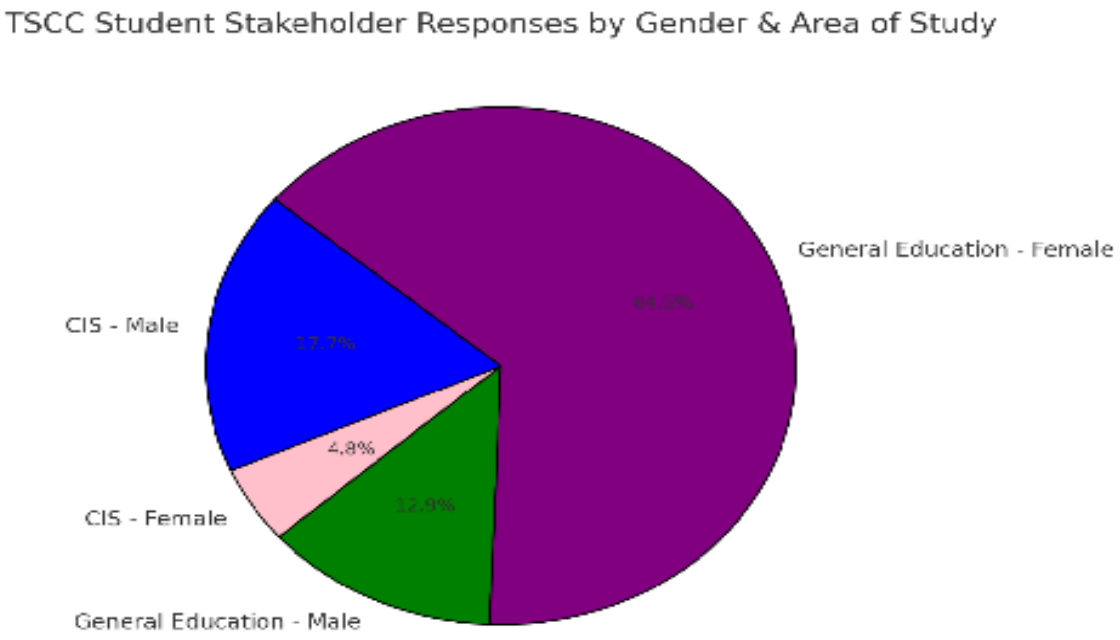

Chart 2: TSCC Stakeholder Responses by Gender & Area of Study

Conclusion

The survey provided valuable insights into institutional decision-making regarding adopting AI-enhanced OER. By incorporating stakeholder perspectives, this research aims to provide evidence-based recommendations that support Trenholm State and similar institutions in modernizing their educational delivery and expanding access to high-quality, AI-driven learning resources.

Strong student support would further validate the researcher's proposed solution, advocating for Trenholm State Community College to adopt the Smart University framework tailored for HBCUs. This framework transforms HBCUs into innovative, technology-driven institutions by leveraging AI and other digital advancements. By integrating AI-enhanced OER, HBCUs can foster a more equitable and accessible educational environment, expand learning opportunities, enhance student engagement, and strengthen institutional competitiveness in the rapidly evolving higher education landscape. The Smart University framework aligns with broader digital transformation goals, positioning HBCUs to

bridge the digital divide and better prepare students for success in an increasingly technology-driven world.

Limitations

While this study offers valuable insights into institutional decision-making regarding adopting AI-enhanced OER, it also has limitations. One major constraint is the scope of the study, as it focuses on a single HBCU. Conducting research at a single institution limited the diversity of perspectives that a broader, more varied sample of institutions could have provided, potentially affecting the generalizability of the findings.

Additionally, the study faced challenges related to survey participation. A lower-than-expected response rate resulted in a smaller sample size, which may have influenced the depth and reliability of the final data analysis. A larger sample across multiple HBCUs could have provided a more comprehensive understanding of stakeholder attitudes and institutional readiness for AI-enhanced OER adoption.

Recommendations for Future Research

Despite the rapid technological advancements, the digital divide remains a persistent challenge among HBCUs. Limited access to cutting-edge technology, inadequate digital infrastructure, and funding disparities continue to hinder the ability of HBCUs to integrate and benefit fully from modern educational innovations. Laufer et al. (2021) explain that before HBCUs can effectively assess the success or failure of any IT implementation, they must address the deep-rooted inequalities caused by this digital divide. These disparities not only impact the technological capabilities of these institutions but also affect student learning outcomes, faculty development, and institutional competitiveness in an increasingly digital world. Laufer et al. (2021) further emphasized that tackling these underlying systemic issues is essential for ensuring that any new technological advancement can reach its full potential and contribute meaningfully to institutional success. Even the most innovative technological solutions may fail to produce the desired impact without closing these digital gaps.

In response to these ongoing challenges, George and Wooden (2023) proposed adopting an AI-driven framework as a strategic approach to bridging the educational inequalities commonly faced by HBCUs. Their research highlights the transformative potential of artificial intelligence in reshaping the HBCU educational landscape by improving access to digital learning resources, enhancing institutional efficiency, and fostering innovation. The authors explored both the benefits and challenges associated with implementing AI-enhanced educational tools, emphasizing the long-term potential of such initiatives. Additionally, they argued that transitioning an institution into an AI-centric entity could significantly enhance its competitive edge, allowing HBCUs to better equip students with 21st-century skills, attract more funding opportunities, and strengthen their academic reputation. By embracing AI-driven solutions, HBCUs have the potential to bridge the digital divide, expand educational access, and better prepare students for success in an increasingly technology-driven society.

References

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry & research design: Choosing among five approaches.* (4th ed.). Sage Publications.

George, B., & Wooden, O. (2023). Managing the strategic transformation of higher education through artificial intelligence. *Administrative Sciences*, *13*(9), 196. https://doi.org/10.3390/admsci13090196

Gibson, D. (2021). *The digital divide*. Pivotal Now. https://www.pivotalnow.org/news/foster-care-system/the-digital-divide

Hall, K. M. (2019). Technology in a Black feminist world. *Frontiers: A Journal of Women Studies*, *40*(2), 243–257.

Laufer, M., Leiser, A., Deacon, B., Perrin de Brichambaut, P., Fecher, B., Kobsda, C., & Hesse, F. (2021). Digital higher education: A divider or bridge builder? Leadership perspectives on edtech in a COVID-19 reality. *International Journal of Educational Technology in Higher Education, 18,* 51. https://doi.org/10.1186/s41239-021-00287-6

Ossiannilsson, E., Ulloa Cazarez, R. L., Goode, C., Mansour, C., & Martins Gomes De Gusmao, C. (2024). Artificial intelligence use to empower the implementation of OER and the UNESCO OER recommendation. *Open Praxis*, *16*(2), 237–257. https://doi.org/10.55982/openpraxis.16.2.650

Samayoa, A. C., Nguyen, T. H., Gasman, M., Commodore, F., & Abiola, U. (2016). Examining the potential of massive open online courses (MOOCs) at Historically Black Colleges and Universities (HBCUs). *The Journal of Negro Education*, *85*(4), 480–488. https://doi.org/10.7709/jnegroeducation.85.4.0480

Schweitzer, E. J. (2024). Digital divide. In *Encyclopedia Britannica*. https://www.britannica.com/topic/digital-divide

Singh, A. (2022). Conceptual framework on smart learning environment for the present and new century—An Indian perspective. *Education & Law Review / Revista de Educación y Derecho*, *25*, 1–18.

White, D. S. (2006). An examination of the state of information technology readiness at the five four—year Historically Black Colleges and Universities (HBCUs) in the Commonwealth of Virginia. *Online Learning, 10*(3). https://doi.org/10.24059/olj.v10i3.1755

Wilson, H. W. (2023, June 8). HBCUs are Experiencing a Bit of a Renaissance. We Have a Responsibility to Make Sure It Is not a Blip. *Diverse: Issues in Higher Education*, *40*(6).